UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Fisheries Science Center
Fish Ecology Division
2725 Montlake Boulevard East
Seattle, Washington 98112-2097

June 13, 2006

MEMORANDUM FOR: F/PR - James H. Lecky

FROM: for F/NWC3 - John W. Ferguson

SUBJECT: Estimation of Percentages for Listed Pacific Salmon and Steelhead Smolts Arriving at Various Locations in the Columbia River Basin in 2006

Each year your office requests a description of how the Fish Ecology Division calculates the percentages of listed wild and hatchery fish at selected Columbia and Snake River projects. The attached outmigration estimates are based on updated, revised information and supercede the version dated April 10, 2006. These estimates are necessary for evaluating the potential impacts of proposed research on listed species. Given new hatchery release estimates, we have computed percentages for 2006. The attached tables show our best estimates for the total numbers of protected juvenile Pacific salmon and steelhead arriving at Columbia River and Snake River dams during the 2006 outmigration, and the percentage of the total collection they will comprise at each dam. We have developed estimates based on a "spread the risk" scenario (transportation with spill; assuming river conditions that have existed in the past) and on a full transportation scenario (with no spill). Tables 1-6 show the development of the estimates, Tables 7-10 summarize the estimates for each listed species at each project, and Table 11 presents our estimates of the total run size for each listed group of fish.

We are providing this information so that Protected Resources Division (F/PR3) staff can better understand how these percentages were derived. Although the following descriptions may seem intimidating, it was necessary to provide this level of detail to describe anticipated conditions for 2006.

Several Snake River species will have unmarked hatchery fish released for the 2006 outmigration. Because we have encountered unmarked hatchery spring/summer Chinook salmon in the past, we have adopted a practice of labeling any unclipped spring/summer Chinook salmon that is greater than 124-mm in fork length as hatchery-origin fish. To derive this fork length, we analyzed data from wild spring/summer Chinook salmon PIT-tagged in their

natal streams (by our wild parr marking project; Permit #1406, Study 1) that were subsequently captured and re-measured at one of the lower Snake River dams during slide-gate evaluations (1989-1994 and 1999-2004).

For several groups of fish, we could find no new information; therefore, our estimates for these groups are the same as last year.

Feel free to discuss this memorandum with all interested parties.

Attachments

cc: F/NWC1 - Ford
F/NWC2 - Dickhoff
F/NWC3 - Casillas
F/NWC3 - Dey
F/NWC3 - Matthews
F/NWC3 - Gores
F/NWC3 - Ruehle
F/NWC3 - Williams
F/NWR3 - Griffin
F/NWR3 - Schaeffer
F/NWC4 - Clarke
F/NWC5 - Collier
F/NWR5 - Ruff
F/PR3 - Jackson

YEARLING CHINOOK SALMON ESTIMATES

Snake River ESU

The estimate of wild spring/summer Chinook salmon arriving at Lower Granite Dam is based on Idaho Department of Fish and Game and Oregon Department of Fish and Wildlife redd counts for brood year 2004. Redd counts were grouped by drainages where fecundity rates were available (Middle Fork of the Salmon River, South Fork of the Salmon River, Salmon River (excluding Middle and South Forks), Clearwater River, Imnaha River, and Grande Ronde River). The egg-to-smolt survival rate (to Lower Granite Dam) was set at 10%. We estimate that 1,838,248 wild/natural spring/summer Chinook salmon will reach Lower Granite Dam in 2006.

Under the 2005 listing guidelines, hatchery fish must now be tracked, not only by their listing status, but also by whether they have been adipose-fin clipped. We estimate that 11,241,270 hatchery spring/summer Chinook salmon smolts will be released from Idaho (10,475,000) and Oregon (766,270). Of these 11,241,270 hatchery spring/summer Chinook salmon smolts, 4,503,770 will be listed (4,394,570 with AD-clips and 109,200 without AD-clips) and 6,737,500 will be unlisted (6,550,000 with AD-clips and 187,500 without AD-clips).

In order to estimate how many hatchery smolts will reach Lower Granite Dam, we first estimated the percentage composition of Snake River spring/summer Chinook salmon arriving at the dam from listed hatcheries (Table 1). Using the mean survival estimates for the 1993-2005 outmigrations (excluding 2001, which was a record low flow year), we estimated the total number of hatchery fish that will arrive at Lower Granite Dam. The mean survival estimate for each hatchery from these 12 years was applied to the 2006 projected release numbers for each hatchery. We estimate that 6,715,705 or 59.74151% of the 11,241,270 hatchery fish released will arrive at Lower Granite Dam. Of these 6,715,705 hatchery spring/summer Chinook salmon smolts, 2,238,267 will be listed (2,178,666 with AD-clips and 59,601 without AD-clips) and 4,477,438 will be unlisted (4,361,000 with AD-clips and 116,438 without AD-clips).

One of the June 2005 changes was the listing of Snake River hatchery fall Chinook salmon under the ESA. While most hatchery fall Chinook salmon are released as subyearlings, the Nez Perce Tribe and Washington Department of Fish and Wildlife release yearling fall Chinook salmon above Lower Granite Dam. Because these fish may not be distinguishable from yearling spring/summer Chinook salmon, they have been included in the yearling estimates detailed below.

Holdover fall Chinook salmon (wild fish that do not outmigrate as subyearlings and hatchery fish released as subyearlings that did not outmigrate as subyearlings) show extreme year-to-year variability in the numbers collected at the various dams. Also, based on PIT-tag detections of holdover fall Chinook salmon, it is known that these fish can stop migrating anywhere along their migration route and holdover to the next spring. These two characteristics of fall Chinook life history make it extremely difficult to estimate how many holdover fish will outmigrate in any given year. Therefore, no estimates of holdover yearling fall Chinook salmon are included.

In 2006, 210,000 AD-clipped and 220,000 Non-AD-clipped yearling listed hatchery fall Chinook salmon will be released above Lower Granite Dam. Using an average survival rate of 0.890, we estimate that 382,700 (186,900 AD-clipped and 195,800 Non-AD-clipped) yearling listed hatchery fall Chinook salmon will arrive at Lower Granite Dam.

Knowing the total number of hatchery fish, the number of listed hatchery fish, and the number of wild fish arriving at Lower Granite Dam, we estimated the percentage composition of listed hatchery fish and wild fish arriving at the dam.

total yearling smolts = total hatchery fish + wild fish =
8,936,653 = (6,715,705 + 382,700) + 1,838,248

% wild fish to dam = wild fish/total smolts =
20.56976% = 1,838,248/8,936,653

% listed hatchery fish = listed hatchery fish/total smolts =

AD-clip spring/summer	24.37899% = 2,178,666/8,936,653
Non-AD-clip spring/summer	0.66693% = 59,601/8,936,653
AD-clip yearling fall	2.09139% = 186,900/8,936,653
Non-AD-clip yearling fall	2.19098% = 195,800/8,936,653

We set fish guidance efficiencies (FGE) at Lower Granite and Little Goose Dams to 0.443 and 0.489, respectively. Using an FGE of 0.443, the total collection at Lower Granite Dam will be 3,958,937 (8,936,653 x 0.443), based on 8,936,653 smolts arriving at the dam. The collection at Lower Granite Dam will be comprised of

Listed wild spring/summer	814,344
Listed AD-clip hatchery spring/summer	965,149
Listed Non-AD-clip hatchery spring/summer	26,403
Listed AD-clip hatchery yearling fall	82,797
Listed Non-AD-clip hatchery yearling fall	86,740
Unlisted AD-clip hatchery spring/summer	1,931,913
Unlisted Non-AD-clip hatchery spring/summer	51,591

Tucannon River fish, both hatchery and wild, are within the Snake River spring/summer Chinook salmon Evolutionarily Significant Unit (ESU) and are considered listed fish. In spring 2006, 40,000 wild and 199,000 AD-clipped hatchery spring/summer Chinook salmon are expected to outmigrate from the Tucannon River. The Tucannon River joins the Snake River between Little Goose and Lower Monumental Dams. Because of the short distance from the confluence to Lower Monumental Dam, we assumed no mortality of these fish prior to Lower Monumental Dam. The estimates shown in Table 2 and Tables 7-8 reflect the addition of these fish above Lower Monumental Dam.

Since 1995, some of the PIT-tagged fish bypassed at the collection dams (Lower Granite, Little Goose, Lower Monumental, and McNary Dams) have been returned to the river to continue migrating inriver. This return of fish to the river requires adjustment of our estimates of the number of listed fish that reach McNary Dam. We estimated the number of fish that will be PIT-tagged for 2006 and, as described in Appendix A, adjusted for fish diverted to transportation at each Snake River collector dam. If transportation occurs at McNary Dam, we also assumed that 100% of all PIT-tagged fish would be returned to the river. A detailed description of how we estimated the impact of returning PIT-tagged fish to the river is presented in Appendix A. We estimated that 66,514 PIT-tagged spring/summer Chinook salmon from the Snake River (including 11,179 wild and 15,609 listed hatchery fish) will be collected at McNary Dam because they were returned to the river at an upstream dam(s). These numbers represent collected fish. Dividing the collected number by the FGE at McNary Dam (0.389), we determined that 28,738 wild (11,179/0.389) and 40,126 listed hatchery (15,609/0.389) fish will arrive at McNary Dam and must be added to the number of fish that were estimated to reach McNary Dam as a result of not having been collected at an upstream dam (column "Listed fish to McNary", Table 2).

Upper Columbia River ESU

The Upper Columbia River ESU spring Chinook salmon is listed as endangered under the ESA. The ESU begins at the confluence of the Yakima and Columbia Rivers and continues upstream to Chief Joseph Dam.

Adults that returned in 2004 produced the smolts that will outmigrate in 2006. We obtained 2004 redd counts for the major Columbia River tributaries in this ESU from Washington Department of Fish and Wildlife (WDFW) and the Yakama Indian Nation. Fecundity estimates for this ESU range from 4,000 to 5,500 eggs

per female. Estimates for egg-to-smolt survival generally range up to 19%. Using the median egg count, 4,750, and a conservative egg-to-smolt survival estimate (to the first dam encountered) of 15%, we estimated the number of smolts that each stream will produce.

We also have hatchery release estimates for this ESU from WDFW and the U.S. Fish and Wildlife Service. There are no survival estimates for these hatcheries. So, based on the distance from the hatchery to the first dam the fish will encounter, we assigned the same survival estimates for Snake River hatcheries, with similar distances to the first dam. Using this method, we assigned a survival rate of 0.782 (Dworshak Hatchery's survival estimate to Lower Granite Dam) to the fish from Winthrop, Methow, Entiat, and Leavenworth Hatcheries, a survival estimate of 0.652 (Rapid River Hatchery's estimate to Lower Granite Dam) to Cle Elum Hatchery, and a survival estimate of 100% to Eastbank and Ringold Hatcheries.

Because we have no per-project survival information for spring Chinook salmon in the Columbia River above McNary Dam, we assigned the same per-project estimate (0.9) used on the Snake and lower Columbia Rivers. Survival estimates derived from a 1 year study using yearling hatchery fall Chinook salmon support using this estimate (M. Brad Eppard, NMFS, Pers. commun., January 1999).

In 2006, 2,571,900 hatchery yearling summer Chinook salmon (all AD-clipped) will be released in the Columbia River above McNary Dam. There are no listed summer Chinook salmon in the Columbia River. Because these fish may not be distinguishable from yearling spring/summer Chinook salmon, they have been included in the yearling estimates detailed below. For the same reasons discussed under the Snake River section above, we were unable to estimate the number of holdover summer Chinook salmon outmigrating through the Columbia River.

Based on the assumptions stated above, we derived the estimates shown in Table 7. Based on projected hatchery releases and the number of wild smolts we estimate will outmigrate from the various drainages along the Columbia River above McNary Dam, we estimate that 8,713,377 spring Chinook salmon will arrive at McNary Dam. The composition of fish arriving at McNary Dam will be

Listed wild spring	409,387
Listed AD-clip hatchery spring	410,052
Listed Non-AD-clip hatchery spring	336,061

Unlisted wild spring	2,966,138
Unlisted AD-clip hatchery spring	3,090,712
Unlisted Non-AD-clip hatchery spring	200,000
Unlisted AD-clip hatchery yearling summer	1,301,027

Note that the numbers shown for Columbia River dams above McNary Dam are numbers arriving at the dam and not the numbers collected at the dam. The reason for this is that fish guidance efficiency (FGE) for these dams is either unknown or is currently being evaluated.

Estimate of Fish Arriving at McNary Dam

McNary Dam is the first dam on the Columbia River below the confluence of the Snake River. To obtain an estimate of the number of spring/summer Chinook salmon smolts arriving at McNary Dam, we added the estimated numbers from the Columbia River above McNary Dam (8,713,377) and the Snake River (1,596,238).

We estimate that 10,309,615 (8,713,377 + 1,596,238) spring/summer Chinook salmon smolts will arrive at McNary Dam in 2006, and that 4,010,440 fish will be collected (FGE = 0.389). The collection at McNary Dam will be comprised of

	Snake R. ESU	Upper Col. R. ESU	Total	Percent
Listed groups				
Wild spring/summer	104,709	159,252	263,961	6.6
AD-clip hatchery spring/summer	157,029	159,510	316,539	7.9
Non-AD-clip hatchery spring/summer	2,771	130,728	133,499	3.3
AD-clip hatchery yearling fall	99,435	0	99,435	2.5
Non-AD-clip hatchery yearling fall	9,103	0	9,103	0.2
Unlisted groups				
Wild spring (from Mid-Columbia)	0	0	1,153,828	28.8
AD-clip hatchery spring/summer	242,476	1,202,287	1,444,763	36.0
Non-AD-clip hatchery spring/summer	5,413	77,800	83,213	2.1
AD-clip hatchery yearling Col. R. summer	0	506,100	506,100	12.6

The ratio of Upper Columbia River ESU wild spring Chinook salmon to Snake River ESU wild spring/summer Chinook salmon at McNary, John Day, and The Dalles Dams will be 60.3%:39.7% (409,387:269,174). The ratio of Upper Columbia River ESU listed hatchery fish to Snake River ESU listed hatchery fish at McNary, John Day, The Dalles, and Bonneville Dams will be

	Ad-clipped	Non-AD-clipped
Snake R spring/summers	37.7 (403,673)	1.9 (7,123)
Snake R yearling falls	23.9 (255,618)	6.4 (23,401)
Upper Columbia R springs	38.3 (410,052)	91.7 (336,061)

We received some redd information from Oregon Department of Fish and Wildlife (ODFW) for the John Day River and, using the same redd to smolt calculation as described above (Upper Columbia River ESU, paragraph 2), we added 472,388 wild unlisted fish between McNary and John Day Dams. Hatchery releases between McNary and John Day Dams will total 820,951 (all AD-clipped) unlisted spring and 480,000 (all AD-clipped) unlisted yearling fall Chinook salmon. We did not receive any 2004 redd count data for the Deschutes River, so we estimated the number of redds by multiplying the 2001 redd count by the change between the 2001 and 2004 redd counts from the John Day River. This resulted in 284,288 wild unlisted fish being added between John Day and The Dalles Dams. Based on data from WDFW (Streamnet), we estimate that 582,113 wild unlisted spring Chinook salmon will be added (from the Klickitat River) between The Dalles and Bonneville Dams. Hatchery releases between John Day and The Dalles Dams will total 320,000 (all AD-clipped) unlisted spring Chinook salmon. Hatchery releases between The Dalles and Bonneville Dams will total 3,058,417 (all AD-clipped) unlisted spring Chinook salmon.

Lower Columbia River ESU

The Lower Columbia River ESU extends from the mouth of the Columbia River to the crest of the Cascade Range, excluding populations above Willamette Falls. This ESU includes wild and hatchery spring-run and fall-run Chinook salmon. The fall-run fish will be discussed below under the subyearling fall Chinook salmon section. We have received information that spawning is occurring in the Wind River, however, these spring Chinook are not considered to be part of the ESU even though they are naturally produced. We estimate that 14,888 wild spring Chinook salmon will be produced above Bonneville Dam. Also, 3,058,417 unlisted AD-clipped hatchery spring Chinook salmon will be

released above Bonneville Dam. This ESU will introduce 1,462,115 wild, 3,054,000 listed hatchery (2,604,000 AD-clipped and 450,000 non-AD-clipped), and 1,350,000 (all AD-clipped) unlisted hatchery spring Chinook salmon to the Columbia River below Bonneville Dam.

Estimate of Fish Arriving at Bonneville Dam

At Bonneville Dam, the ratio of Upper Columbia River ESU, Snake River ESU, and Lower Columbia River ESU listed wild fish will be 58.6%:38.5%:2.9% (298,443:196,228:14,888).

Fish transported from Snake River dams and McNary Dam are released below Bonneville Dam. Transportation at McNary Dam does not occur during the spring migration; therefore, all transported fish are from the Snake River ESU. The number of listed transport fish returned to the river will be 3,686,688. The composition of these fish will be

Snake River ESU (Total number = 3,686,688)	
Listed wild spring/summers	1,431,933
Listed AD-clip hatchery spring/summers	1,751,681
Listed Non-AD-clip hatchery spring/summers	45,960
Listed AD-clip hatchery yearling falls	306,125
Listed Non-AD-clip hatchery yearling falls	150,989

A total of 7,139,388 (3,686,688 listed + 3,452,700 unlisted fish) transported yearling Chinook salmon will be released below Bonneville Dam.

Upper Willamette River ESU

The Upper Willamette River ESU contains spring Chinook salmon populations above Willamette Falls. This ESU will introduce 6,920,485 listed wild and 5,908,490 listed hatchery (5,756,990 AD-clipped and 151,500 Non-AD-clipped) spring Chinook salmon to the Columbia River below Bonneville Dam.

The ratio of Upper Columbia River ESU, Snake River ESU, Lower Columbia River ESU, and Upper Willamette River ESU listed wild fish at Tongue Point will be 2.9%:15.8%:14.3%:67.0% (298,443:1,628,161:1,477,003:6,920,485). The ratio of Upper Columbia River ESU, Snake River ESU, Lower Columbia River ESU, and Upper Willamette River ESU listed hatchery fish at Tongue Point will be

	Ad-clipped		Non-AD-clipped	
Upper Columbia R spring	2.7	(298,928)	23.0	(244,989)
Snake R spring/summer	18.3	(2,045,959)	4.8	(51,153)
Lower Columbia R spring	23.3	(2,604,000)	42.2	(450,000)
Upper Willamette R spring	51.4	(5,756,990)	14.2	(151,500)
Snake R yearling fall	4.4	(492,470)	15.8	(168,049)

The per-project survival estimate remained the same (0.9) (Table 2).

Summary

Tables 7a, 7b, and 8 present a summary of the estimated number of fish that will be collected, or will be arriving (Columbia River dams above McNary Dam), at each of the dams during 2006. This information is derived from the data shown in Tables 1-2 and Appendix Table A1. Table 11 shows the estimated number of listed spring, spring/summer, and yearling fall Chinook salmon expected to outmigrate from each ESU.

COHO SALMON ESTIMATES

Lower Columbia River coho salmon were listed under the Endangered Species Act in June 2005. The Lower Columbia River ESU extends from the mouth of the Columbia River to the Big White Salmon River on the Washington State shore and the Hood River on the Oregon shore. It includes the Willamette River to Willamette Falls, Oregon. This ESU includes both wild and hatchery-origin coho salmon.

Hatchery coho salmon are released in the Snake River and the Columbia River above the Lower Columbia River ESU. At this time we have no estimates of wild coho salmon from these areas; therefore, we have included no wild information in Table 7. As with yearling and subyearling Chinook salmon, hatchery fish must be tracked based on whether they have an adipose-fin clip.

We assigned coho salmon the same survival rates as yearling Chinook salmon in all our calculations. Enough coho have been released over the past couple years that we are able to estimate FGE at Lower Granite Dam at 0.521. Also, as with the other species discussed here, all our calculations are based on the "Transportation with Spill" scenario.

Based on hatchery outplanting records, we estimate that 736,500 hatchery coho salmon (100,000 AD-clipped and 636,500 non-AD-clipped) were released into the Snake River drainage. We estimate that 8,300,743 hatchery coho salmon (1,914,936 AD-clipped and 6,385,807 non-AD-clipped) were released into the Columbia River drainage above the Lower Columbia River ESU. From these releases, we estimate that 7,233,865 hatchery coho salmon (1,572,612 AD-clipped and 5,661,253 non-AD-clipped) will reach Tongue Point.

Lower Columbia River ESU

With the June 2005 change in ESU listing status, all hatchery coho in this ESU are now listed (except those released at Youngs Bay, Tongue Point, and Blind Slough in Oregon and Deep River in Washington). We obtained wild and hatchery coho salmon production estimates for 2006 from the various agencies involved in the lower Columbia River system. From the information provided, we estimate that 12,754 listed wild coho salmon will arrive at Bonneville Dam. No listed hatchery fish are released above Bonneville Dam.

Listed wild coho salmon estimates from below Bonneville Dam to Tongue Point are 1,105,190, while listed hatchery releases in this area were 11,525,500 (10,070,000 AD-clipped and 1,455,500

non-AD-clipped) and 2,101,000 unlisted (1,375,000 AD-clipped and 726,000 non-AD-clipped).

In addition, another 5,850 listed wild and 1,281,500 hatchery (56,500 listed AD-clipped and 1,225,000 unlisted AD-clipped) coho salmon will enter the Columbia River below Tongue Point.

Summary

Table 7c presents a summary of the estimated number of fish that will be collected, or will be arriving, at various locations during 2006. Table 11 shows the estimated number of listed coho salmon expected to outmigrate from the Lower Columbia River ESU.

SUBYEARLING FALL CHINOOK SALMON ESTIMATES

To estimate the 2006 collection number at Lower Granite Dam, we used the 2005 collection number and the adult returns over the dam for 2004 and 2005. In 2005, 1,636,103 unmarked hatchery subyearling fall Chinook salmon were released above Lower Granite Dam. Assuming a survival rate of 0.783 (the estimated survival rate of hatchery subyearling fall Chinook salmon released above Lower Granite Dam in 2005), 1,280,523 (1,636,103 x 0.783) of these fish would have arrived at Lower Granite Dam. Assuming an FGE of 0.341 (derived from PIT-tagged hatchery subyearling fall Chinook salmon in 2005), 436,658 (1,280,523 x 0.341) would have been collected at Lower Granite Dam. Through December 31, 2005 594,772 unclipped (and without a coded-wire tag) subyearling Chinook salmon had been collected at Lower Granite Dam. By removing the estimated 436,658 unmarked hatchery subyearling fall Chinook salmon, we estimate that 158,114 (594,772 - 436,658) wild subyearling fall Chinook salmon were collected at Lower Granite Dam in 2005. These wild subyearling fall Chinook salmon were from the 2004 adult return. The adult count over Lower Granite Dam in 2004 was 14,960. Of these, 2,487 were hatchery fish that were returned to Lyons Ferry Hatchery and 12,473 adults were passed above Lower Granite Dam. The 2006 outmigration will be the result of the 2005 adults passed over Lower Granite Dam. Through December 31, 2005, 11,170 adults had been counted in the adult ladder. Of these, 1,274 fish were returned to Lyons Ferry Hatchery, leaving 9,896 adults that were passed above Lower Granite Dam. The 2005 count of 9,896 adults represents only 79.3% of the 2004 count (12,473). We applied this decrease (79.3%) to the 2005 subyearling collection number to arrive at the estimated 2006 collection number.

(total wild fall Chinook collected at Granite) = (wild fall Chinook collected in 2005) x (% change between adult counts for 2005 and 2006 outmigrations) =

125,384 = 158,114 x 0.793

We estimated the total number of wild subyearling fall Chinook salmon arriving at Lower Granite Dam by dividing the number of wild fish collected by the FGE at Lower Granite Dam. The average estimated FGE for PIT-tagged hatchery subyearling fall Chinook salmon arriving at Lower Granite Dam from 1995-2005 (excluding 2001) is 0.341.

total wild fall Chinook = total wild fall Chinook collected/FGE =
367,695 = 125,384/0.341

The Nez Perce Tribe along with WDFW will release 4,861,500 listed subyearling fall Chinook salmon in the Clearwater and Snake Rivers in 2006. Of these fish, 2,791,500 will be AD-clipped and 2,070,000 will be non-AD-clipped. Assuming a survival rate of 0.450 (the average estimated survival rate of PIT-tagged hatchery subyearling fall Chinook salmon released above Lower Granite Dam from 1995-2005 (excluding 2001)), 2,187,675 (4,861,500 x 0.450) of the 4,861,500 hatchery fish will arrive at Lower Granite Dam. Of these fish, 1,256,175 will be AD-clipped and 931,500 will be non-AD-clipped. In 2006, NMFS and the U.S. Fish and Wildlife Service conducted research using 328,000 hatchery subyearling fall Chinook salmon (all non-AD-clipped). Based on survival to Lower Granite Dam (0.450), 147,600 (328,000 x 0.450) will arrive at Lower Granite Dam. Combining the production and research non-AD-clipped fish, the total number of non-AD-clipped hatchery fish will be 1,079,100 (931,500 + 147,600). By adding the non-AD-clipped fish to the total number of wild fall Chinook salmon (367,695), we estimate that 1,446,795 non-AD-clipped subyearling fall Chinook salmon will arrive at Lower Granite Dam. The percentage of non-AD-clipped subyearling fall Chinook salmon that are wild will be 25.4145% (367,695/1,446,795). We added the total AD-clipped hatchery fish (1,256,175), the total non-AD-clipped hatchery fish (1,079,100), and the total wild fish (367,695) to determine the total number of subyearling fall Chinook salmon arriving at Lower Granite Dam (2,702,970).

Knowing the total number of hatchery fish, the number of listed hatchery fish, and the number of wild fish arriving at Lower Granite Dam, we estimated the percentage composition of listed hatchery fish and wild fish arriving at the dam.

% listed fish = listed fish/total smolts =

Wild subyearling fall	13.6034% = 367,695/2,702,970
AD-clip subyearling fall	46.4739% = 1,256,175/2,702,970
Non-AD-clip subyearling fall	39.9228% = 1,079,100/2,702,970

We set fish guidance efficiencies (FGE) at Lower Granite and Little Goose Dams to 0.519 and 0.495, respectively. Using an FGE of 0.519, the total collection at Lower Granite Dam will be 1,402,841 (2,702,970 x 0.519), based on 2,702,970 smolts arriving at the dam. The collection at Lower Granite Dam will be comprised of

Listed wild subyearling fall	190,834
Listed AD-clip hatchery subyearling fall	651,955
Listed Non-AD-clip hatchery subyearling fall	560,052

NMFS has conducted subyearling fall Chinook salmon survival tests since 1995. As part of these tests, we estimated actual FGE's for McNary Dam (factoring in effects of spill). To more accurately estimate the collection number at McNary Dam, we averaged these actual FGE's for 1995-2005 (excluding 2001). We also averaged the number of fall Chinook salmon adults crossing McNary Dam for each of the brood years (1994-2004) and the number of juvenile subyearling fall Chinook salmon collected at McNary Dam (1995-2005). The 2005 count of 134,037 adults represents 133.2% of the average for 1994-2004 count (100,646). We applied this change (133.2%) to the average 1995-2004 subyearling collection number (6,519,094) to arrive at an estimated 2006 collection number of 8,683,433 (6,519,094 x 1.332).

Based on the NMFS subyearling fall Chinook salmon survival studies conducted in 1995-2005 (excluding 2001), per-project survival was set at 75%. We set the FGEs at Little Goose, Lower Monumental, and McNary Dams, based on 1995-2005 (excluding 2001) NMFS fall Chinook salmon survival study results, to 0.495, 0.422, and 0.481, respectively.

Lower Columbia River ESU

The Lower Columbia River ESU includes both wild and hatchery tule and late-run bright fall Chinook salmon. This ESU includes fall Chinook salmon from the Clackamas River.

To determine the number of wild outmigrants from this ESU, we assumed that 50% of the adults counted in the spawning areas were female and that every female spawned successfully. We used average fecundity and set the egg-to-smolt survival rate at 15%, the same used for spring/summer Chinook salmon.

Based on these assumptions, we estimate that 1,623,609 tule fall Chinook salmon will outmigrate from above Bonneville Dam. No late-run bright fish will enter the Columbia River above Bonneville Dam. Additionally, we estimate that 16,699,877 tule fall Chinook salmon and 5,238,871 late-run bright fall Chinook salmon will enter the Columbia River below Bonneville Dam.

The ratio of Snake River ESU and Lower Columbia River ESU (tule fall Chinook salmon) listed wild fish at Bonneville Dam will be 0.4%:99.6% (6,424:1,623,609).

With the June 2005 change in ESA listing status, most hatchery fish released in this ESU are now listed. In 2006, hatchery releases above Bonneville Dam will total 15,000,000 listed tule (14,550,000 AD-clipped and 450,000 non-AD-clipped) and 6,000,000

unlisted (2,650,000 AD-clipped and 3,350,000 non-AD-clipped) subyearling fall Chinook salmon. Below Bonneville Dam releases totaled 23,698,500 listed tule (7,687,500 AD-clipped and 16,011,000 non-AD-clipped) and 6,744,000 unlisted (175,000 AD-clipped and 6,569,000 non-AD-clipped) subyearling fall Chinook salmon.

The ratio of Snake River ESU and Lower Columbia River ESU (tule fall Chinook salmon) listed hatchery AD-clipped fish at Bonneville Dam will be 0.2%:99.8% (26,456:14,550,000), while the ratio for hatchery non-AD-clipped fish at Bonneville Dam will be 2.3%:97.7% (10,496:450,000).

Fish transported from Snake River dams and McNary Dam are released below Bonneville Dam. The number of listed transport fish returned to the river will be 308,687 wild, 1,091,221 AD-clipped, and 838,026 non-AD-clipped fish, all from the Snake River ESU. A total of 10,826,080 transported subyearling fall Chinook salmon will be released below Bonneville Dam.

The ratio of Snake River ESU, Lower Columbia River ESU (tule fall Chinook salmon), and Lower Columbia River ESU (late-run bright fall Chinook salmon) listed wild fish at Tongue Point will be 1.3%:76.7%:21.9% (315,111:18,323,486:5,238,871). The ratio for hatchery fish at Tongue Point will be

	Ad-clipped		Non-AD-clipped	
Snake R. subyearling fall	4.8	(1,117,677)	4.9	(848,522)
Lower Columbia R. subyearling fall - Tule	95.2	(22,237,500)	95.1	(16,461,000)
Lower Columbia R. subyearling fall - Late run	0.0	(0)	0.0	(0)

Summary

Tables 7a and 7b present a summary of the estimated number of fish that will be collected, or will be arriving (Columbia River dams above McNary Dam), at each of the dams during 2006. This information is derived from the data shown in Table 2. Table 11 shows the estimated number of subyearling fall Chinook salmon expected to outmigrate from each ESU.

SOCKEYE SALMON ESTIMATES

The sockeye salmon collection count at Lower Granite Dam was based on IDFG's estimate of wild and hatchery-reared sockeye salmon smolts exiting the upper Salmon River in 2006 and their estimates of survival to Lower Granite Dam. IDFG estimates that 13,500 wild fish and 31,534 hatchery fish that have overwintered in the lakes will survive to Lower Granite Dam in spring 2006. All of these fish are listed as endangered.

listed sockeye (wild and hatchery) to Lower Granite Dam =
IDFG's estimated wild fish + estimated hatchery fish =
45,034 = 13,500 + 31,534

To determine the percentage of wild sockeye salmon collected at Lower Granite Dam, we estimated the number of kokanee arriving at Lower Granite Dam. In 2005, WDFW staff at Lower Granite Dam estimated that 13 kokanee were collected. With an FGE of 0.258 (the 2005 estimate), 50 (13/0.258) kokanee reached Lower Granite Dam. Assuming the same amount of spill from Dworshak Dam in 2006 with a release of the same number of kokanee, we estimated the total number of wild *O. nerka* arriving at Lower Granite Dam to be 13,550 (50 + 13,500). We then estimated the percentage of wild *O. nerka* arriving at Lower Granite Dam that will be listed Snake River sockeye salmon.

% listed wild sockeye =
listed wild sockeye/total wild *O. nerka* to Lower Granite Dam =
99.6% = 13,500/13,550

A total of 45,084 (45,034 listed sockeye + 50 kokanee) *O. nerka* will arrive at Lower Granite Dam.

% total listed sockeye =
total listed sockeye/total *O. nerka* to Lower Granite Dam =
99.9% = 45,034/45,084

An FGE of 0.338 (average for 1998-2005 (excluding 2001)) was used to estimate the number of *O. nerka* smolts reaching Lower Granite Dam that will be collected.

O. nerka salmon collected = total *O. nerka* salmon x FGE =
15,238 = 45,084 x 0.338

Because of extreme year-to-year variability, the count used at McNary Dam for 2006 is based on the average of the counts at the dam from 1985 to 2005 (536,894). Project survival was set at the yearling Chinook salmon level (Table 2).

Summary

Table 7 presents a summary of the estimated number of fish that will be collected, or will be arriving (Columbia River dams above McNary Dam), at each of the dams during 2006. This information is derived from the data shown in Table 2. Table 11 shows the estimated number of sockeye salmon expected to outmigrate from the Snake River ESU.

STEELHEAD ESTIMATES

Introduction

Because of the time of year that steelhead spawn, it is very difficult to obtain redd count information. All of our steelhead estimates, not otherwise explained, are based on adult counts in the spawning areas. We assumed that 65% of the adults were females and that every female spawned successfully. To estimate the number of outmigrants, we used average fecundity estimates, and assigned an egg-to-smolt survival rate of 1%. This survival rate is conservative as all rates we calculated or found in the literature were from 0.5% to 0.75%.

Snake River Steelhead ESU

Prior to the 2001 outmigration, nearly all hatchery steelhead were fin-clipped, allowing us to use the juvenile collection numbers at Lower Granite Dam without making any adjustments for unclipped hatchery fish. Because it was known that a large number of unclipped steelhead were to be released for the 2005 outmigration, WDFW not only recorded the number of unclipped steelhead collected but also the number of unclipped steelhead that had fin erosion, a strong indicator that a fish is of hatchery origin. Based on the information provided by WDFW (Fred Mensik, WDFW, Pers. commun., January 2006), we determined that 741,845 wild steelhead were collected at Lower Granite Dam in 2005 (0.429, or 557,772, of the 1,299,617 unclipped steelhead collected at Lower Granite Dam in 2005 had fin erosion). We applied the 2005 estimated FGE (0.683) to the collection number to determine that 1,086,157 (741,845/0.683) wild steelhead arrived at Lower Granite Dam in 2005.

To our knowledge, no research has been conducted on the age-class distribution of migrating juvenile steelhead in the Snake River; however, there has been research on the mid-Columbia River (Pevan et al. 1994[1]). Pevan's research showed that in the mid-Columbia River, migrating steelhead were 0.7% age-1, 43.2% age-2, 46.4% age-3, and 8.6% age-4 smolts. The age-class of the remainder of smolts (1.1%) was greater than age-4, up to age-7. Because of this age-class breakdown, we decided to base our estimates on age-classes 1 to 4. Because steelhead spawn in the spring, our annual counts were from July 1 to June 30, rather than by calendar year. Using the adult counts at Lower Granite Dam of the 4 years that comprised the 2005 wild smolt outmigration (2001-2004 brood years, July 1, 2000-June 30, 2004), and applying

[1] Pevan, C. M., R. R. Whitney, and K. R. Williams. 1994. Age and length of steelhead smolts from the Mid-Columbia River Basin, Washington. N. Am. J. Fish. Manage. 14:77-86.

the smolt age-class percentages to the adult counts for each of these 4 years, we estimated that 50,217 of the adults passing Lower Granite Dam produced the 2005 steelhead outmigration. We performed the same calculation to estimate the number of adults from the 4 years (2002-2005 brood years) producing the 2006 wild outmigration. We calculated that the 2006 wild outmigration will be based on 50,118 adults, or 99.8% of the number of fish producing the 2005 outmigration. We applied the change in the number of adults to the number of wild steelhead that arrived at Lower Granite Dam in 2005 (1,086,157) to determine the estimated 2006 arrival number.

$$\left(\begin{array}{c}\text{total wild steelhead arriving at Lower Granite}\end{array}\right) = \left(\begin{array}{c}\text{wild steelhead arriving in 2005}\end{array}\right) \times \left(\begin{array}{c}\text{\% change between adult counts for 2005 and 2006 outmigrations}\end{array}\right) =$$

$$1,083,985 = 1,086,157 \times 0.998$$

For the steelhead hatchery release numbers, we used IDFG's, ODFW's, and WDFW's estimates of hatchery releases in Idaho, Oregon, and Washington. We estimate that 9,060,500 hatchery smolts (Table 4) will be released from Idaho (7,792,000), Oregon (1,108,500), and Washington (160,000 above Lower Granite Dam).

In order to estimate how many hatchery smolts will reach Lower Granite Dam, we attempted to use the survival estimates for the 1993-2005 outmigrations (excluding 2001) (from the NMFS survival study, Research Action #1212). Survival estimates have been made for all but two hatchery release groups, releases into the Grande Ronde Basin from Irrigon and Lyons Ferry Hatcheries. We applied the survival estimate from Dworshak National Fish Hatchery (0.795) to these hatchery release groups. Using the 2006 projected release number and survival estimate for each hatchery, we estimated how many total hatchery fish will arrive at Lower Granite Dam. We estimate that 7,000,383 or 77.2627% of the 9,060,500 hatchery fish released will arrive at the dam (Table 4).

Knowing the numbers of hatchery and wild fish arriving at Lower Granite Dam, we estimated the percentage composition of listed wild fish arriving at the dam.

total smolts = total hatchery fish + wild fish =
8,084,368 = 7,000,383 + 1,083,985

% wild fish to Lower Granite Dam = wild fish/total smolts =
13.40841% = 1,083,985/8,084,368

% listed hatchery fish = listed hatchery fish/total smolts =

AD-clip summer	34.93840% = 2,824,549/8,084,368
Non-AD-clip summer	6.39550% = 517,036/8,084,368

We set FGEs at Lower Granite and Little Goose Dams at 0.500 and 0.572, respectively. Using an FGE of 0.500, the total collection at Lower Granite Dam will be 4,042,184 (8,084,368 x 0.500), based on 8,084,368 smolts arriving at the dam. The collection at Lower Granite Dam will be comprised of

Listed wild	541,993
Listed hatchery AD-clip	1,412,275
Listed hatchery Non-AD-clip	258,518
Unlisted hatchery AD-clip	1,650,479
Unlisted hatchery Non-AD-clip	45,271

Wild/natural Tucannon River drainage fish are listed within the Snake River ESU. In spring 2006, 20,000 wild fish are expected to outmigrate from the Tucannon River. In addition, 64,000 (all Non-AD-clipped) listed hatchery fish and 160,000 (all AD-clipped) unlisted hatchery fish will be released into the Tucannon River or released directly from Lyons Ferry Hatchery. The Tucannon River joins the Snake River between Little Goose and Lower Monumental Dams. Because of the short distance from the confluence to Lower Monumental Dam, we assumed no mortality of these fish prior to Lower Monumental Dam. The estimates shown in Table 5 and Tables 9-10 reflect the addition of these fish above Lower Monumental Dam.

Except when research studies require an alternate disposition, all PIT-tagged fish bypassed at the collection dams (Lower Granite, Little Goose, Lower Monumental, and McNary Dams) are returned to the river to continue migrating inriver. This return of fish to the river requires adjustment of our estimates of the number of listed fish that reach McNary Dam. We estimated the number of fish that will be PIT tagged for 2006 and, as described

in Appendix B, adjusted for fish diverted to transportation at each Snake River collector dam. A detailed description of how we estimated the impact of returning PIT-tagged fish to the river is presented in Appendix B. We estimated that 9,180 PIT-tagged steelhead from the Snake River (including 2,969 wild fish) will be collected at McNary Dam because they were returned to the river at an upstream dam(s). These numbers represent collected fish. Dividing the collected number by the FGE at McNary Dam (0.206), we determined that 14,413 wild Snake River steelhead (2,969/0.206) will arrive at McNary Dam and must be added to the number of fish that were estimated to reach McNary Dam as a result of not having been collected at an upstream dam (column "Listed fish to McNary", Table 5).

Upper-Columbia River ESU Steelhead

Very little is known regarding wild steelhead in the Columbia River above the confluence with the Yakima River. Also, little is known regarding dam passage of smolts at the dams above McNary Dam. Because of this lack of information, the estimates of wild steelhead from the listed Upper Columbia River ESU are based on what little information is available and on broad generalizations based on this information. No FGE's have been established for the dams in this reach, so the numbers presented in this section of the memorandum (and in Tables 9 and 10) are the number of fish arriving at the dam, not collection numbers (unless otherwise noted in the text).

As mentioned above, Pevan et al. (1994) showed that migrating steelhead were 0.7% age-1, 43.2% age-2, 46.4% age-3, and 8.6% age-4 smolts. The age-class of the remainder of smolts (1.1%) was greater than age-4, up to age-7. Because of this age-class breakdown, we decided to base our estimates on age-classes 1 to 4.

We based our estimates of wild fish on counts collected at Rock Island Dam by the Fish Passage Center. During the 2005 outmigration, 5,497 wild steelhead smolts were counted in the Smolt Monitoring Program's sample. It is estimated that the sample represents 3-5% of the fish passing the dam. Using a 4% sample rate, we estimated that 137,425 wild steelhead passed Rock Island Dam in 2005.

We then examined the adult counts at Rock Island Dam. Because steelhead spawn in the spring, our annual counts were from July 1 to June 30, rather than by calendar year. Using the adult counts of the 4 years that comprised the 2005 wild smolt outmigration (2001-2004 brood years, July 1, 2000-June 30, 2004), and applying the smolt age-class percentages to the adult counts for each of

these 4 years, we estimated that 20,653 of the adults passing Rock Island Dam produced the 2005 steelhead outmigration. We performed the same calculation to estimate the number of adults from the 4 years (2002-2005 brood years) producing the 2006 wild outmigration. We calculated that the 2006 wild outmigration will be based on 12,171 adults, or 0.589 of the number of fish producing the 2005 outmigration. We applied the change in the number of adults to the 2005 Rock Island Dam collection to arrive at the estimated 2006 collection number.

total wild steelhead collected at Rock	=	wild steelhead collected in 2005	x	% change between adult counts for 2005 and 2006	=

3,238 = 5,497 x 0.589

Since this represents 4% of the fish passing the dam, we estimate that 80,950 wild steelhead smolts will pass the dam in 2006. Using the smolt age-class percentages, we estimate that 567 smolts will be age-1, 34,970 will be age-2, 37,561 will be age-3, and 6,962 will be age-4.

To determine the number of wild smolts passing the two dams above Rock Island Dam (Rocky Reach and Wells Dams), we used the estimate of wild smolts passing Rock Island Dam (80,950) and the adult counts at all three dams.

By comparing the adult counts at each of the three dams for the 4 years that will produce the 2006 outmigration (2002-2005), we calculated the number of adults "lost" between each dam. We assigned this "loss" to adults migrating up rivers between the dams. The difference in adult counts between dams varied between years, so we applied the age-class percentages to each year's differences between dams to determine the number of wild smolts added from the rivers between the dams.

From Rock Island Dam to McNary Dam, the only adjustment made to the wild steelhead smolt count was for per-project survival (0.9).

To determine the number of hatchery smolts arriving at each dam in 2006, we used the outplanting data for the 3 years comprising the 2006 outmigration (2004-2006). Because hatchery fish are larger than equivalent age-class wild fish, we assigned age-2 status to hatchery fish released in 2006, age-3 to those released in 2005, and age-4 to those released in 2004. All of the hatchery outplants will be of listed hatchery stocks.

Because there are no survival data for the various hatcheries releasing fish in this section of the Columbia River, we assumed that all fish released survived to the first dam. We again applied the age-class percentages to the number of fish released each of the 3 years to determine the number of hatchery fish that would outmigrate in 2006. Beginning at Wells Dam and assuming 90% per-project survival, we determined both the number of listed hatchery and the total number of hatchery fish reaching each dam through McNary Dam (Tables 5 and 9).

Mid-Columbia River ESU Steelhead

The Mid-Columbia River wild summer-run and winter-run steelhead are listed protected species. With the January 2006 listings, some hatchery steelhead in this ESU are now listed. Only summer steelhead from the Yakima and Walla Walla Rivers enter the Columbia River above McNary Dam.

Based on our assumptions described in the steelhead introduction, 95,177 wild summer steelhead will enter above McNary Dam in 2006.

WDFW will release 51,000 Non-AD-clipped listed (from Mid-Columbia River ESU stock) and 85,000 AD-clipped unlisted hatchery steelhead (Lyons Ferry Hatchery stock) into the Touchet River, a tributary of the Walla Walla River, and 100,000 (all AD-clipped) non-listed hatchery steelhead (from Mid-Columbia River ESU stock) into the Walla Walla River. The Walla Walla River enters the Columbia River above McNary Dam. For these fish, survival to McNary Dam was set at 100%.

An additional 228,114 wild from this ESU will be added between McNary and John Day Dams. Hatchery summer steelhead will be released between McNary and John Day Dams. Release numbers will be

Summer Steelhead	
Listed hatchery AD-clip	150,000

Between John Day and The Dalles Dams, 725,148 wild and 166,000 (all AD-clipped) listed hatchery summer steelhead will be added. Between The Dalles and Bonneville Dams, 16,557 wild winter, 120,000 (all AD-clipped) unlisted hatchery summer, and 5,000 (all AD-clipped) unlisted hatchery winter steelhead will be added.

Estimate of Fish Arriving at McNary Dam

McNary Dam is the first dam on the Columbia River below the confluence of the Snake River. To obtain an estimate of the number of steelhead smolts arriving at McNary Dam, we added the estimated numbers from the Upper Columbia River (991,646), Mid-Columbia (95,177) and the Snake River (705,891) ESUs.

We estimate that 1,792,714 (991,646 + 95,177 + 705,891) steelhead smolts will arrive at McNary Dam in 2006, and that 369,299 fish will be collected. Of the 369,299 smolts collected at McNary Dam, 52,597 (0.142) will be wild (12,157 Upper Columbia River ESU, 20,834 Snake River ESU, and 19,606 Mid-Columbia River ESU), 150,027 (0.406) will be listed hatchery AD-clipped (104,702 Upper Columbia River ESU and 45,325 Snake River ESU), 58,058 (0.157) will be listed hatchery Non-AD-clipped (34,351 Upper Columbia River ESU, 13,201 Snake River ESU, and 10,506 Mid-Columbia River ESU), and 157,233 (0.426) will be unlisted hatchery fish (125,739 AD-clipped and 31,494 Non-AD-clipped). The ratio of Upper Columbia River ESU wild fish, Snake River ESU wild fish and Mid-Columbia River ESU wild fish at McNary, John Day, and The Dalles Dams will be

	McNary Dam	John Day	The Dalles
Upper Columbia	23.1 (59,013)	12.2 (53,112)	4.6 (47,801)
Snake River	39.6 (101,138)	20.9 (91,024)	7.9 (81,922)
Mid-Columbia			
Summer	37.3 (95,177)	66.9 (290,962)	87.6 (914,499)
Winter	"	"	"

The ratio of Upper Columbia River ESU, Snake River ESU, and Mid-Columbia River ESU hatchery fish at McNary, John Day, and The Dalles Dams will be

	McNary Dam	John Day	The Dalles
Upper Columbia			
AD-clipped	69.8 (508,262)	56.8 (457,436)	46.2 (411,692)
Non-AD-clipped	59.2 (166,750)	59.2 (150,075)	59.2 (135,068)
Snake River			
AD-clipped	30.2 (220,022)	24.6 (198,020)	20.0 (178,218)
Non-AD-clipped	22.7 (64,084)	22.7 (57,676)	22.7 (51,908)
Mid-Columbia			
Summer			
AD-clipped	0.0 (0)	18.6 (150,000)	33.8 (301,000)
Non-AD-clipped	18.1 (51,000)	18.1 (45,900)	18.1 (41,310)
Winter			
AD-clipped	0.0 (0)	0.0 (0)	0.0 (0)
Non-AD-clipped	0.0 (0)	0.0 (0)	0.0 (0)

Lower Columbia River ESU

We estimate that 49,160 (21,704 summer and 27,456 winter) wild steelhead from this ESU will arrive at Bonneville Dam. With the January 2006 listings, some hatchery steelhead in this ESU are now listed. Because the hatchery steelhead are denoted as of summer or winter stock, we have decided to track each run individually. At Bonneville Dam, the ratio of wild fish in the various ESUs will be

Upper Columbia	4.3	(43,021)
Snake River	7.3	(73,730)
Mid-Columbia		
summer	81.9	(823,049)
winter	1.7	(16,557)
Lower Columbia		
summer	2.2	(21,704)
winter	2.7	(27,456)

Between The Dalles and Bonneville Dams, 40,000 (all AD clipped) listed and 30,000 (all AD clipped) unlisted hatchery summer will be added. There will be 50,000 AD-clipped winter steelhead released above Bonneville Dam from this ESU. At Bonneville Dam, the ratio of hatchery fish in the various ESUs will be

	Bonneville Dam	
Upper Columbia		
AD-clipped	41.5	(370,523)
Non-AD-clipped	59.2	(121,561)
Snake River		
AD-clipped	18.0	(160,396)
Non-AD-clipped	22.7	(46,717)
Mid-Columbia		
Summer		
AD-clipped	30.4	(270,900)
Non-AD-clipped	18.1	(37,179)
Winter		
AD-clipped	0.0	(0)
Non-AD-clipped	0.0	(0)
Lower Columbia		
Summer		
AD-clipped	4.5	(40,000)
Non-AD-clipped	0.0	(0)
Winter		
AD-clipped	5.6	(50,000)
Non-AD-clipped	0.0	(0)

Another 552,698 (41,714 summer and 510,984 winter) wild steelhead are expected to enter the Columbia River from Washington and Oregon downstream from Bonneville Dam.

Fish transported from Snake River dams are released below Bonneville Dam. The number of listed transport fish returned to the river will be 3,834,906 (939,707 wild, 2,418,848 AD-clipped hatchery, and 476,351 Non-AD-clipped hatchery), all from the Snake River ESU. A total of 6,921,092 transported steelhead will be released below Bonneville Dam.

Upper Willamette River ESU

The Upper Willamette River wild winter-run steelhead are listed protected species. With the January 2006 listings, some hatchery steelhead in this ESU are now listed. Because the hatchery steelhead are denoted as of summer or winter stock, we have decided to track each run individually.

Based on our assumptions described in the steelhead introduction, 289,114 winter steelhead will enter the Columbia River in 2006, 220,642 of which will be from listed stocks.

At Tongue Point the ratios of wild fish from the various ESUs will be

	Tongue Point	
Upper Columbia	1.6	(43,021)
Snake River	37.3	(1,013,437)
Mid-Columbia		
summer	30.3	(823,049)
winter	0.6	(16,557)
Lower Columbia		
summer	2.3	(63,418)
winter	19.8	(538,440)
Upper Willamette		
summer	0	(0)
winter	8.1	(220,642)

There are no listed winter steelhead hatchery releases from this ESU. At Tongue Point the ratios of listed hatchery fish from the various ESUs will be

	Tongue Point	
Upper Columbia		
AD-clipped	9.0	(370,523)
Non-AD-clipped	17.8	(121,561)
Snake River		
AD-clipped	62.5	(2,579,244)
Non-AD-clipped	76.7	(523,068)
Mid-Columbia		
Summer		
AD-clipped	6.6	(270,900)
Non-AD-clipped	5.5	(37,179)
Winter		
AD-clipped	0.0	(0)
Non-AD-clipped	0.0	(0)
Lower Columbia		
Summer		
AD-clipped	2.1	(88,000)
Non-AD-clipped	0.0	(0)
Winter		
AD-clipped	19.8	(815,000)
Non-AD-clipped	0.0	(0)
Upper Willamette		
Summer		
AD-clipped	0.0	(0)
Non-AD-clipped	0.0	(0)
Winter		
AD-clipped	0.0	(0)
Non-AD-clipped	0.0	(0)

Summary

Tables 9 and 10 summarize the estimated number of steelhead that will be collected, or will be arriving (Columbia River dams above McNary Dam), at each of the collection dams during 2006. This information is derived from the data shown in Tables 4-5 and Appendix Table B1. Table 11 shows the estimated number of steelhead expected to outmigrate from each ESU.

CHUM ESTIMATES

Columbia River ESU

Wild and all hatchery chum salmon in the Columbia River are listed protected species.

Because of the lack of data, we cannot make an estimate of listed chum salmon. We expect the hatchery (all non-AD-clipped) chum salmon outmigration to be 20,000 from the Columbia River, 100,000 from Chinook River, and 395,000 from Grays River.

Full Transportation Scenario

The estimates shown in Table 3 were derived using the same methodology utilized under the Transportation with Spill Scenario, with one major difference. The number of fish removed at each dam under the Transportation with Spill Scenario was based on an FGE value that adjusted for spill. For our estimates under the Full Transportation Scenario, we used the FGE values developed during developmental testing of the diversion screens installed in each of the turbine intakes. Using the results from these tests, the FGEs for spring/summer Chinook salmon and sockeye salmon were changed from the values in Table 2 to 60.0%, 65.0%, 50.0%, and 80.0% at Lower Granite, Little Goose, Lower Monumental, and McNary Dams, respectively. Subyearling fall Chinook salmon FGEs were changed from the values in Table 2 to 55.0%, 60.0%, 40.0%, and 65.0% at Lower Granite, Little Goose, Lower Monumental, and McNary Dams, respectively. Steelhead FGEs (in Table 6) were changed from the values in Table 5 to 80.0%, 90.0%, 65.0%, and 90.0% at Lower Granite, Little Goose, Lower Monumental, and McNary Dams, respectively. Using the same formulas as under the Transportation with Spill Scenario, we derived the values found in Tables 3 and 6-10.

Because the adjusted FGE at Lower Granite Dam was changed from 44.3% to 60.0% for yearling spring/summer Chinook and sockeye salmon, the total number of fish collected at Lower Granite Dam will be 5,361,992 (8,936,653 x 0.60) spring/summer Chinook salmon and 53,506 (89,177 x 0.60) *O. nerka* salmon.

Because more PIT-tagged fish will be collected at the upstream dams, the number of PIT-tagged fish that are returned to the river and subsequently collected at McNary Dam will be different under this scenario. The effects of this are shown in Appendices A and B.

As under the Transportation with Spill Scenario, to estimate the number of spring/summer Chinook salmon smolts arriving at McNary Dam, we added the estimated numbers from the Columbia River above McNary (8,713,377) and the Snake River (888,678).

8,713,377 + 888,678 = 9,602,055

Tables 7-10 show the changes in percentages of listed fish at each dam.

Table 1. Estimated percentage composition of Snake River spring/summer Chinook salmon arriving at Lower Granite Dam from listed hatcheries compared with total hatchery releases projected for spring 2006.

Hatchery	2006 Total hatchery releases[a]		Survival to Lower Granite Dam	Fish to Lower Granite Dam	
	AD-clipped	Non-AD-clipped	Mean[b]	AD-clipped	Non-AD-clipped
Dworshak[c]	1,010,000	0	0.782	789,820	0
Kooskia[c]	635,000	0	0.674	427,990	0
Lookingglass					
Imnaha[d]	325,000	0	0.637	207,025	0
Grande Ronde[d]	422,570	18,700	0.598	252,697	11,183
Clearwater[c]	1,770,000	87,500	0.621	1,099,170	54,338
Rapid River[c]	3,135,000	0	0.652	2,044,020	0
Sawtooth[d]	1,551,000	0	0.384	595,584	0
McCall[d]	1,096,000	90,500	0.535	586,360	48,418
Pahsimeroi[d]	1,000,000	0	0.537	537,000	0
Nez Perce[c]	0	100,000	0.621	0	62,100
Totals					
All stocks	10,944,570	296,700		6,539,666	176,039
Listed stocks	4,394,570	109,200		2,178,666	59,601
Percent of listed stocks	40.06460%			33.32885%	

a Data from USFWS, NPT, IDFG and ODFW.
b Mean survival estimate made from PIT-tag detections of marked hatchery fish releases as part of the NMFS survival studies (Research Action #1212) for 1993-2005 (excluding 2001).
c Non-listed stocks in 2006.
d Listed stocks in 2006.

Table 2. Estimate of listed threatened and endangered species arriving at various locations during outmigration year 2006 under past transportation and spill conditions.

Yearling spring/summer Chinook salmon

Snake River ESU

Rearing type	Total Collection* Granite	Total Collection* McNary	Of Granite Total % Listed Fish	Listed Fish to Granite[a]	FGE[1] Granite	FGE[1] Goose	FGE[1] Low Mon**	FGE[1] McNary	Project Survival	Listed fish to McNary[b]	Of Fish Collected at McNary Listed Fish	Of Fish Collected at McNary % Listed Fish
Wild	3,958,937	4,010,440	20.570	1,838,248	0.443	0.489	0.360	0.389	0.9	269,174	104,709	2.61
Listed Hatchery*** AD-clipped	3,958,937	4,010,440	24.379	2,178,666	0.443	0.489	0.360	0.389	0.9	403,673	157,029	3.92
Non-AD-clipped	3,958,937	4,010,440	0.667	59,601	0.443	0.489	0.360	0.389	0.9	7,123	2,771	0.07

Upper Columbia River ESU

Rearing type	Number of listed fish passing dam Wells	Number of listed fish passing dam Rocky Reach	Number of listed fish passing dam Rock Island	Of dam total, % listed fish Wells	Of dam total, % listed fish Rocky Reach	Of dam total, % listed fish Rock Island	FGE McNary	Project Survival	Listed fish to McNary[b]	Of Fish Collected at McNary Listed Fish	Of Fish Collected at McNary % Listed Fish
Wild****	83,363	164,802	561,572	3.0	4.8	9.0	0.389	0.9	409,387	159,252	3.97
Listed Hatchery AD-clipped	50,517	124,983	562,485	1.8	3.7	9.1	0.389	0.9	410,052	159,510	3.98
Non-AD-clipped	391,000	512,210	460,989	14.0	15.0	7.4	0.389	0.9	336,061	130,728	3.26

Fall Chinook salmon

Rearing type	Total Collection* Granite	Total Collection* McNary	Of Granite Total % Listed Fish	Listed Fish to Granite[a]	FGE[1] Granite	FGE[1] Goose	FGE[1] Low Mon	FGE[1] McNary	Project Survival	Listed fish to McNary[b]	Of Fish Collected at McNary Listed Fish	Of Fish Collected at McNary % Listed Fish
Wild****	1,402,842	8,683,433	13.603	367,696	0.519	0.495	0.422	0.481	0.75	29,339	14,112	0.16
Listed Subyearling Hatchery AD-clipped	1,402,842	8,683,433	46.474	1,256,175	0.519	0.495	0.422	0.481	0.75	120,828	58,118	0.67
Non-AD-clipped	1,402,842	8,683,433	39.923	1,079,100	0.519	0.495	0.422	0.481	0.75	47,937	23,058	0.27
Listed Yearling Hatchery AD-clipped	3,958,937	4,010,440	2.091	186,900	0.443	0.489	0.360	0.389	0.9	255,618	99,435	2.48
Non-AD-clipped	3,958,937	4,010,440	2.191	195,800	0.443	0.489	0.360	0.389	0.9	23,401	9,103	0.23

Sockeye salmon

Rearing type	Total Collection* Granite	Total Collection* McNary	Of Granite Total % Listed Fish	Listed Fish to Granite[a]	FGE[1] Granite	FGE[1] Goose	FGE[1] Low Mon	FGE[1] McNary	Project Survival	Listed fish to McNary[b]	Of Fish Collected at McNary Listed Fish	Of Fish Collected at McNary % Listed Fish
Wild and listed hatchery*****	15,238	536,894	99.9	45,034	0.338	0.454	0.393	0.293	0.9	6,483	1,899	0.35

*Note:Total Collection is the total number of fish collected of that species or run, regardless of rearing type.

**Note: Listed wild and hatchery spring Chinook salmon enter the Snake River above Lower Monumental Dam. WDFW predicts that 40,000 wild and 199,000 listed hatchery (all non-AD-clipped) fish will outmigrate from the Tucannon River and Lyons Ferry Fish Hatchery in 2006 (Michael Gallinat, WDFW, Pers. commun., February 2006)

***Note: Based on 2006 hatchery releases, it was estimated that 33.31464% and 33.8567% of the AD-clipped and non-AD-clipped, respectively, hatchery fish arriving at Lower Granite Dam are products of a listed hatchery (Table 1). Because Table 2 is based on the total collection at Lower Granite Dam, which includes both wild and hatchery (listed and unlisted) fish, these estimates of 33.31464% and 33.8567% of all hatchery fish were adjusted to 24.379% and 0.667% of the total collection at Lower Granite Dam.

****Note: Estimated values based on the average collection numbers from 1995-2005 (excluding 2001) (Fish Passage Center Weekly Reports), and on the average number of adult returns from 1994-2005 (excluding 2001) and the 2005 adult returns (FPC Weekly Reports 1994-2005).

*****Note: The Lower Granite Dam estimate is based on IDFG's estimate of 13,500 wild sockeye salmon smolts and 31,534 hatchery fish that overwintered in the lakes arriving at Lower Granite Dam in 2006 (Catherine Willard, IDFG, Pers. commun., February 2006). The McNary Dam estimate is the average collection count at McNary Dam from 1985-2005 (Annual Fish Passage Reports 1985-2005, and WDFW's 2005 fish counts).

1 The FGE used in this table is adjusted for spill conditions, and PIT-tag detection efficiency at a dam. This estimate was obtained from the NMFS survival studies conducted in 1995-2005 (excluding 2001) (Steven G. Smith, NMFS, Pers. commun., February 2006).

Formulas:

a) Listed fish to Granite = $((\text{Collection}_{\text{Granite}})/(\text{FGE}_{\text{Granite}}))\times(\text{Of Granite Total \% Listed Fish})$

b) Listed Fish to McNary = $(\text{Listed Fish to Granite})\times(1-\text{FGE}_{\text{Granite}})\times(\text{Project Survival})\times(1-\text{FGE}_{\text{Goose}})\times(\text{Project Survival})\times(1-\text{FGE}_{\text{Low Mon}})\times(\text{Project Survival})^2 +$
$(\text{listed Tucannon fish})\times(1-\text{FGE}_{\text{Low Mon}})\times(\text{Project Survival})^2 + (\text{PIT-tagged fish})$

where: listed Tucannon fish = 40,000 wild and 199,000 hatchery (all non-AD-clipped)
PIT-tagged fish = fish collected at Snake River dams, returned to the river, and subsequently arrived at McNary Dam; See Appendix Table A1.

Table 3. Estimate of listed threatened and endangered species arriving at various locations during outmigration year 2006 under full transportation conditions (no spill).

Yearling spring/summer Chinook salmon

Snake River ESU

Rearing type	Total Collection* Granite	Total Collection* McNary	Of Granite Total % Listed Fish	Listed Fish to Granite[a]	FGE Granite	FGE Goose	FGE Low Mon**	FGE McNary	Project Survival	Listed fish to McNary[b]	Of Fish Collected at McNary Listed Fish	Of Fish Collected at McNary % Listed Fish
Wild	5,361,992	7,681,644	20.570	1,838,248	0.60	0.65	0.50	0.80	0.9	134,116	107,293	1.40
Listed Hatchery*** AD-clipped	5,361,992	7,681,644	24.379	2,178,666	0.60	0.65	0.50	0.80	0.9	226,628	181,302	2.36
Non-AD-clipped	5,361,992	7,681,644	0.667	59,601	0.60	0.65	0.50	0.80	0.9	2,737	2,190	0.03

Upper Columbia River ESU

Rearing type	Number of listed fish passing dam Wells	Number of listed fish passing dam Rocky Reach	Number of listed fish passing dam Rock Island	Of dam total, % listed fish Wells	Of dam total, % listed fish Rocky Reach	Of dam total, % listed fish Rock Island	FGE McNary	Project Survival	Listed fish to McNary[b]	Of Fish Collected at McNary Listed Fish	Of Fish Collected at McNary % Listed Fish
Wild****	83,363	164,802	561,572	3.0	4.8	9.0	0.80	0.9	409,387	327,510	4.26
Listed Hatchery AD-clipped	50,517	124,983	562,485	1.8	3.7	9.1	0.80	0.9	410,052	328,042	4.27
Non-AD-clipped	391,000	512,210	460,989	14.0	15.0	7.4	0.80	0.9	336,061	268,849	3.50

Subyearling fall Chinook salmon

Rearing type	Total Collection* Granite	Total Collection* McNary	Of Granite Total % Listed Fish	Listed Fish to Granite[a]	FGE Granite	FGE Goose	FGE Low Mon	FGE McNary	Project Survival	Listed fish to McNary[b]	Of Fish Collected at McNary Listed Fish	Of Fish Collected at McNary % Listed Fish
Wild****	1,486,634	11,734,510	13.603	367,696	0.55	0.60	0.40	0.65	0.75	26,065	16,942	0.14
Listed Subyearling Hatchery AD-clipped	1,486,634	11,734,510	46.474	1,256,175	0.55	0.60	0.40	0.65	0.75	110,426	71,777	0.61
Non-AD-clipped	1,486,634	11,734,510	39.923	1,079,100	0.55	0.60	0.40	0.65	0.75	36,875	23,969	0.20
Listed Yearling Hatchery AD-clipped	5,361,992	7,681,644	2.091	186,900	0.60	0.65	0.50	0.80	0.9	190,834	152,667	1.99
Non-AD-clipped	5,361,992	7,681,644	2.191	195,800	0.60	0.65	0.50	0.80	0.9	8,993	7,194	0.09

Sockeye salmon

Rearing type	Total Collection* Granite	Total Collection* McNary	Of Granite Total % Listed Fish	Listed Fish to Granite[a]	FGE Granite	FGE Goose	FGE Low Mon	FGE McNary	Project Survival	Listed fish to McNary[b]	Of Fish Collected at McNary Listed Fish	Of Fish Collected at McNary % Listed Fish
Wild and listed hatchery*****	27,050	536,894	99.9	45,034	0.60	0.65	0.50	0.80	0.9	2,068	1,655	0.31

*Note: Total Collection is the total number of fish collected of that species or run, regardless of rearing type.

**Note: Listed wild and hatchery spring Chinook salmon enter the Snake River above Lower Monumental Dam. WDFW predicts that 40,000 wild and 199,000 listed hatchery (all non-AD-clipped) fish will outmigrate from the Tucannon River and Lyons Ferry Fish Hatchery in 2006 (Michael Gallinat, WDFW, Pers. commun., February 2006)

***Note: Based on 2006 hatchery releases, it was estimated that 33.31464% and 33.8567% of the AD-clipped and non-AD-clipped, respectively, hatchery fish arriving at Lower Granite Dam are products of a listed hatchery (Table 1). Because Table 2 is based on the total collection at Lower Granite Dam, which includes both wild and hatchery (listed and unlisted) fish, these estimates of 33.31464% and 33.8567% of all hatchery fish were adjusted to 24.379% and 0.667% of the total collection at Lower Granite Dam.

****Note: Estimated values based on the average collection numbers from 1995-2005 (excluding 2001) (Fish Passage Center Weekly Reports), and on the average number of adult returns from 1994-2005 (excluding 2001) and the 2005 adult returns (FPC Weekly Reports 1994-2005).

*****Note: The Lower Granite Dam estimate is based on IDFG's estimate of 13,500 wild sockeye salmon smolts and 31,534 hatchery fish that overwintered in the lakes arriving at Lower Granite Dam in 2006 (Catherine Willard, IDFG, Pers. commun., February 2006). The McNary Dam estimate is the average collection count at McNary Dam from 1985-2005 (Annual Fish Passage Reports 1985-2005, and WDFW's 2005 fish counts).

1 The FGE used in this table is adjusted for spill conditions, and PIT-tag detection efficiency at a dam. This estimate was obtained from the NMFS survival studies conducted in 1995-2005 (excluding 2001) (Steven G. Smith, NMFS, Pers. commun., February 2006).

Formulas:

a) Listed fish to Granite = $((\text{Collection}_{\text{Granite}})/(\text{FGE}_{\text{Granite}}))\times(\text{Of Granite Total \% Listed Fish})$

b) Listed Fish to McNary = $(\text{Listed Fish to Granite})\times(1-\text{FGE}_{\text{Granite}})\times(\text{Project Survival})\times(1-\text{FGE}_{\text{Goose}})\times(\text{Project Survival})\times(1-\text{FGE}_{\text{Low Mon}})\times(\text{Project Survival})^2 +$
$(\text{listed Tucannon fish})\times(1-\text{FGE}_{\text{Low Mon}})\times(\text{Project Survival})^2 + (\text{PIT-tagged fish})$

where: listed Tucannon fish = 40,000 wild and 199,000 hatchery (all non-AD-clipped)
PIT-tagged fish = fish collected at Snake River dams, returned to the river, and subsequently arrived at McNary Dam; See Appendix Table A1.

Table 4. Estimated percentage composition of Snake River steelhead arriving at Lower Granite Dam from total hatchery releases projected for spring 2006. No hatchery in the Snake River ESU above Lower Granite Dam is listed.

Hatchery	2006 Total hatchery releases[a] AD-clipped	Non-AD-clipped	Survival to Lower Granite Dam Mean[b]	Fish to Lower Granite Dam AD-clipped	Non-AD-clipped
Dworshak[c]	1,937,000	220,000	0.795	1,539,915	174,900
Clearwater[c]	527,000	318,000	0.702	369,954	223,236
Hagerman[c,d]	1,050,000	340,000	0.728	764,400	247,520
Magic Valley[c,d]	1,410,000	190,000	0.788	1,111,080	149,720
Niagara Springs[d]	1,800,000	0	0.784	1,411,200	0
Irrigon (released above Lower Granite Dam)[c,d]	1,008,500	100,000	0.795	801,758	79,500
Lyons Ferry (released into Grande Ronde)[d]	160,000	0	0.795	127,200	0
Totals					
All stocks	7,892,500	1,168,000		6,125,507	874,876
Listed stocks	3,638,000	688,000		2,824,549	517,036
Percent of listed stocks	47.74571%			47.73432%	

a Data from USFWS, IDFG, ODFW, and WDFW.
b Mean survival estimate made from PIT-tag detections of marked hatchery fish releases as part of the NMFS survival studies (Research Action #1212) for 1993-2005 (excluding 2001).
c Listed stocks in 2006.
d Un-listed stocks in 2006.

Table 5. Estimates of listed threatened and endangered steelhead arriving at various locations during outmigration year 2006 under past transportation and spill conditions.

Snake River ESU

Rearing type	Total Collection* Granite	McNary	Of Granite Total % Listed Fish	Listed Fish to Granite[a]	FGE[1] Granite	Goose	Low Mon**	McNary	Project Survival	Listed fish to McNary[b]	Of Fish Collected at McNary Listed Fish	% Listed Fish
Wild	4,042,184	343,592	13.4084	1,083,985	0.500	0.572	0.485	0.206	0.9	101,138	20,834	6.06
Listed Hatchery*** AD-clipped	4,042,184	343,592	34.9384	2,824,549	0.500	0.572	0.485	0.206	0.9	220,022	45,325	13.19
Non-AD-clipped	4,042,184	343,592	6.3955	517,036	0.500	0.572	0.485	0.206	0.9	64,084	13,201	3.84

Upper Columbia River ESU

Rearing type	Number of listed fish passing dam Wells	Rocky Reach	Rock Island	Of dam total, % listed fish Wells	Rocky Reach	Rock Island	FGE[1] McNary	Project Survival	Listed fish to McNary[b]	Of Fish Collected at McNary Listed Fish	% Listed Fish
Wild***	61,761	70,168	80,950	11.2	13.3	10.7	0.206	0.9	59,013	12,157	3.54
Listed Hatchery*** AD-clipped	482,126	450,683	669,165	81.1	79.5	71.8	0.206	0.9	508,262	104,702	30.47
Non-AD-clipped	44,739	40,265	177,488	7.5	7.1	19.0	0.206	0.9	166,750	34,351	10.00

Mid-Columbia River ESU

Rearing type	Total Collection* Granite	McNary	Of Granite Total % Listed Fish	Listed Fish to Granite[a]	FGE[1] Granite	Goose	Low Mon**	McNary	Project Survival	Listed fish to McNary[b]	Of Fish Collected at McNary Listed Fish	% Listed Fish
Summer-run(First dam reached is McNary Dam) Wild								0.206	0.9	95,177	19,606	5.71
Listed Hatchery*** AD-clipped								0.206	0.9	0	0	0.00
Non-AD-clipped								0.206	0.9	51,000	10,506	3.06
Winter-run(First dam reached is Bonneville Dam) Wild								0.206	0.9	0	0	0.00
Listed Hatchery*** AD-clipped								0.206	0.9	0	0	0.00
Non-AD-clipped								0.206	0.9	0	0	0.00

*Note: Total Collection is the total number of fish collected of that species or run, regardless of rearing type.

**Note: Hatchery steelhead and listed wild steelhead enter the Snake River above Lower Monumental Dam. WDFW predicts that 20,000 wild fish and 64,000 (all Non-AD-clipped) listed hatchery fish will outmigrate from the Tucannon River and Lyons Ferry Fish Hatchery in 2006. An additional 51,000 Non-AD-clipped listed Mid-Columbia hatchery summer steelhead will outmigrate from the Touchet and Walla Walla Rivers above McNary Dam Michael Gillanat, WDFW, Pers. commun., February 2006).

***Note: Estimated values based on 2005 collection numbers (Fish Passage Center Weekly Reports), and on the number of adult returns from 1995-2005

(FPC Weekly Reports 1995-2005).

1 The FGE used in this table is adjusted for spill conditions, and PIT-tag detection efficiency at a dam. This estimate was obtained from the NMFS survival studies conducted in 1995-2005 (excluding 2001) (Steven G. Smith, NMFS, Pers. commun., February 2006).

Formulas:

a) Listed fish to Granite = $((\text{Collection}_{\text{Granite}})/(\text{FGE}_{\text{Granite}}))$x(Of Granite Total % Listed Fish)

b) Listed Fish to McNary = (Listed Fish to Granite)x$(1-\text{FGE}_{\text{Granite}})$x(Project Survival)x$(1-\text{FGE}_{\text{Goose}})$x(Project Survival)x$(1-\text{FGE}_{\text{Low Mon}})x(\text{Project Survival})^2$ + (listed Tucannon fish)x$(1-\text{FGE}_{\text{Low Mon}})x(\text{Project Survival})^2$ +(Rock Island listed fish)x$(\text{Project Survival})^2$ + (PIT-tagged fish)

where: listed Tucannon fish = 20,000 wild and 64,000 (all Non-AD-clipped) hatchery fish
PIT-tagged fish = fish collected at Snake River dams, returned to the river, and subsequently arrived at McNary Dam; See Appendix Table B1.

Table 6. Estimates of listed threatened and endangered steelhead arriving at various locations during outmigration year 2006 under full transportation conditions (no spill).

Snake River ESU

Rearing type	Total Collection* Granite	McNary	Of Granite Total % Listed Fish	Listed Fish to Granite[a]	FGE Granite	Goose	Low Mon**	McNary	Project Survival	Listed fish to McNary[b]	Of Fish Collected at McNary Listed Fish	% Listed Fish
Wild	6,467,494	991,712	13.4084	1,083,985	0.80	0.90	0.65	0.90	0.90	28,027	25,224	2.54
Listed Hatchery*** AD-clipped	6,467,494	991,712	34.9384	2,824,549	0.80	0.90	0.65	0.90	0.90	31,272	28,145	2.84
Non-AD-clipped	6,467,494	991,712	6.3955	517,036	0.80	0.90	0.65	0.90	0.90	20,519	18,467	1.86

Upper Columbia River ESU

Rearing type	Number of listed fish passing dam Wells	Rocky Reach	Rock Island	Of dam total, % listed fish Wells	Rocky Reach	Rock Island	FGE[1] McNary	Project Survival	Listed fish to McNary[b]	Of Fish Collected at McNary Listed Fish	% Listed Fish
Wild***	61,761	70,168	80,950	11.2	13.3	10.7	0.90	0.90	59,013	53,112	5.36
Listed Hatchery*** AD-clipped	482,126	450,683	669,165	81.1	79.5	71.8	0.90	0.90	508,262	457,436	46.13
Non-AD-clipped	44,739	40,265	177,488	7.5	7.1	19.0	0.90	0.90	166,750	150,075	15.13

Mid-Columbia River ESU

Rearing type	Total Collection* Granite	McNary	Of Granite Total % Listed Fish	Listed Fish to Granite[a]	FGE[1] Granite	Goose	Low Mon**	McNary	Project Survival	Listed fish to McNary[b]	Of Fish Collected at McNary Listed Fish	% Listed Fish
Summer-run(First dam reached is McNary Dam) Wild								0.90	0.90	95,177	85,659	8.64
Listed Hatchery*** AD-clipped								0.90	0.90	0	0	0.00
Non-AD-clipped								0.90	0.90	51,000	45,900	4.63
Winter-run(First dam reached is Bonneville Dam) Wild								0.90	0.90	0	0	0.00
Listed Hatchery*** AD-clipped								0.90	0.90	0	0	0.00
Non-AD-clipped								0.90	0.90	0	0	0.00

*Note: Total Collection is the total number of fish collected of that species or run, regardless of rearing type.

**Note: Hatchery steelhead and listed wild steelhead enter the Snake River above Lower Monumental Dam. WDFW predicts that 20,000 wild fish and 64,000 (all Non-AD-clipped) listed hatchery fish will outmigrate from the Tucannon River and Lyons Ferry Fish Hatchery in 2006. An additional 51,000 Non-AD-clipped listed Mid-Columbia hatchery summer steelhead will outmigrate from the Touchet and Walla Walla Rivers above McNary Dam Michael Gillanat, WDFW, Pers. commun., February 2006).

***Note: Estimated values based on 2005 collection numbers (Fish Passage Center Weekly Reports), and on the number of adult returns from 1995-2005 (FPC Weekly Reports 1995-2005).

2 The FGE used in this table is adjusted for spill conditions, and PIT-tag detection efficiency at a dam. This estimate was obtained from the NMFS survival studies conducted in 1995-2005 (excluding 2001) (Steven G. Smith, NMFS, Pers. commun., February 2006).

Formulas:

a) Listed fish to Granite = $((\text{Collection}_{\text{Granite}})/(\text{FGE}_{\text{Granite}}))$x(Of Granite Total % Listed Fish)

b) Listed Fish to McNary = (Listed Fish to Granite)x$(1-\text{FGE}_{\text{Granite}})$x(Project Survival)x$(1-\text{FGE}_{\text{Goose}})$x(Project Survival)x$(1-\text{FGE}_{\text{Low Mon}})x(\text{Project Survival})^2$ + (listed Tucannon fish)x$(1-\text{FGE}_{\text{Low Mon}})x(\text{Project Survival})^2$ +(Rock Island listed fish)x$(\text{Project Survival})^2$ + (PIT-tagged fish)

where: listed Tucannon fish = 20,000 wild and 64,000 (all Non-AD-clipped) hatchery fish
PIT-tagged fish = fish collected at Snake River dams, returned to the river, and subsequently arrived at McNary Dam; See Appendix Table B1.

Table 7a. Juvenile Chinook salmon collection at each of eight mainstem collection facilities in 2006 under a full transportation scenario.

	Full Transportation Scenario Chinook salmon	
	Yearlings	Subyearlings
Total fish collected at:*		
Lower Granite	5,114,222	1,486,634
Little Goose	2,040,585	547,352
Lower Monumental	932,945	205,470
Ice Harbor**	579,810	104,019
Columbia River		
Wells***	2,791,961	NA
Rocky Reach***	3,421,048	NA
Rock Island***	6,215,468	NA
Wanapum***	5,593,921	NA
Priest Rapids***	5,034,529	NA
McNary****	7,666,473	11,734,510
John Day** ****	6,238,873	1,868,628
The Dalles** ****	3,985,039	1,001,051
Bonneville (I & II combined)** *****	5,066,159	7,688,029
---To the tailrace of Bonneville	12,665,398	25,626,763
---To Tongue Point*****	39,454,611	91,651,977

	Spring/Summer Chinook			Fall Chinook - Yearlings		Fall Chinook - Subyearlings		
		Hatchery		Hatchery			Hatchery	
Total listed fish at:	Wild	Ad-clip	No Ad-clip	Ad-clip	No Ad-clip	Wild	Ad-clip	No Ad-clip
Lower Granite	1,102,949	1,307,842	35,760	112,140	117,480	202,232	690,896	593,505
Little Goose	443,095	521,932	13,946	43,735	45,817	74,458	254,375	218,518
Lower Monumental	142,340	248,178	3,379	235,597	11,102	30,892	130,875	43,704
Ice Harbor**	89,412	152,204	1,825	127,222	5,995	15,639	66,255	22,125
Columbia River								
Wells***	83,363	50,517	391,000	0	0	NA	NA	NA
Rocky Reach***	164,802	124,983	512,210	0	0	NA	NA	NA
Rock Island***	561,572	562,485	460,989	0	0	NA	NA	NA
Wanapum***	505,415	506,237	414,890	0	0	NA	NA	NA
Priest Rapids***	454,874	455,613	373,401	0	0	NA	NA	NA
McNary****	434,803	510,688	271,041	152,667	7,194	16,942	71,777	23,969
John Day** ****	293,492	344,714	182,953	103,050	4,856	2,395	10,145	3,388
The Dalles** ****	176,095	206,828	109,772	61,830	2,914	1,283	5,435	1,815
Bonneville (I & II combined)** *****	158,486	186,145	98,795	55,647	2,623	488,237	4,369,892	136,634
---To the tailrace of Bonneville	396,215	465,363	246,988	139,118	6,558	1,627,457	14,566,307	455,447
---To Tongue Point*****	10,436,143	2,506,354	300,073	530,590	180,957	23,890,729	23,401,730	17,016,143
Percent listed fish at:								
Lower Granite	21.57%	25.57%	0.70%	2.19%	2.30%	13.60%	46.47%	39.92%
Little Goose	21.71%	25.58%	0.68%	2.14%	2.25%	13.60%	46.47%	39.92%
Lower Monumental	15.26%	26.60%	0.36%	25.25%	1.19%	15.03%	63.70%	21.27%
Ice Harbor**	15.42%	26.25%	0.31%	21.94%	1.03%	15.03%	63.70%	21.27%
Columbia River								
Wells***	2.99%	1.81%	14.00%	0.00%	0.00%	NA	NA	NA
Rocky Reach***	4.82%	3.65%	14.97%	0.00%	0.00%	NA	NA	NA
Rock Island***	9.04%	9.05%	7.42%	0.00%	0.00%	NA	NA	NA
Wanapum***	9.04%	9.05%	7.42%	0.00%	0.00%	NA	NA	NA
Priest Rapids***	9.04%	9.05%	7.42%	0.00%	0.00%	NA	NA	NA
McNary****	5.67%	6.66%	3.54%	1.99%	0.09%	0.14%	0.61%	0.20%
John Day** ****	4.70%	5.53%	2.93%	1.65%	0.08%	0.13%	0.54%	0.18%
The Dalles** ****	4.42%	5.19%	2.75%	1.55%	0.07%	0.13%	0.54%	0.18%
Bonneville (I & II combined)** *****	3.13%	3.67%	1.95%	1.10%	0.05%	6.35%	56.84%	1.78%
---To the tailrace of Bonneville	3.13%	3.67%	1.95%	1.10%	0.05%	6.35%	56.84%	1.78%
---To Tongue Point*****	26.45%	6.35%	0.76%	1.34%	0.46%	26.07%	25.53%	18.57%

* Note: "Total fish collected at:" is the total number of fish collected of that species or run, regardless of rearing type.
** Note: These dams have no transportation facilities, therefore, no fish are removed from the river at these dams.
*** Note: The numbers shown for these dams represent the number of fish arriving at the dam, not the number collected; FGE's at these dams are not currently established. Also, there is no transportation from these dams.
**** Note: (See next page)
***** Note: (See next page)

**** Note: The percentage of listed wild and hatchery spring/summer and fall Chinook salmon at McNary, John Day, and The Dalles Dams are:
For example, If you handle 1,000 yearling Chinook salmon at Tongue Point, under the Full Transportation scenario (above),
26.83% of them will be listed wild fish, or 268 fish. To these 268 fish, apply the percentages
listed below under the Tongue Point section to determine how many are from each ESU
(SR, 268 x 0.1658 = 44; UCR, 268 x 0.0282 = 8; etc).

Yearling	**Full Transportation**		
Chinook salmon		**Hatchery**	
	Wild	**Ad-clip**	**No Ad-clip**
SR - Spr/Sum	24.68	27.50	0.80
SR - Fall (Yrlg)	0.00	23.00	2.60
UCR	75.32	49.50	96.60
LCR - Spring	0.00	0.00	0.00
UWR	0.00	0.00	0.00
Subyearling			
Chinook salmon			
SR - Fall (Subyrlg)	100.00	100.00	100.00
LCR - Tule fall	0.00	0.00	0.00
LCR - Late run fall	0.00	0.00	0.00

***** Note: Because the Columbia River is a free flowing river below Bonneville Dam and there are no survival estimates available, survival was set at 100% to Tongue Point.
The percentage of listed wild and hatchery spring/summer and fall Chinook salmon at and downstream of Bonneville Dam are:

Bonneville Dam

Yearling	**Full Transportation**		
Chinook salmon		**Hatchery**	
	Wild	**Ad-clip**	**No Ad-clip**
SR - Spr/Sum	17.94	27.50	0.80
SR - Fall (Yrlg)	0.00	23.00	2.60
UCR	54.75	49.50	96.60
LCR - Spring	27.31	0.00	0.00
UWR	0.00	0.00	0.00
Subyearling			
Chinook salmon			
SR - Fall (Subyrlg)	0.24	0.11	1.20
LCR - Tule fall	99.76	99.89	98.80
LCR - Late run fall	0.00	0.00	0.00

Tongue Point

Yearling	**Full Transportation**		
Chinook salmon		**Hatchery**	
	Wild	**Ad-clip**	**No Ad-clip**
SR - Spr/Sum	16.58	19.40	5.10
SR - Fall (Yrlg)	0.00	4.70	16.70
UCR	2.82	2.60	22.60
LCR - Spring	15.22	22.80	41.60
UWR	65.38	50.50	14.00
Subyearling			
Chinook salmon			
SR - Fall (Subyrlg)	1.37	4.97	5.20
LCR - Tule fall	76.70	95.03	94.80
LCR - Late run fall	21.93	0.00	0.00

SR - Spr/Sum = Snake River ESU - Spring/Summer Chinook salmon
SR - Fall (Yrlg) = Snake River ESU - Yearling Fall Chinook salmon
SR - Fall (Subyrlg) = Snake River ESU - Subyearling Fall Chinook salmon
UCR = Upper Columbia River ESU
LCR - Spring = Lower Columbia River ESU - Spring Chinook salmon
UWR = Upper Willamette River ESU

LCR - Tule fall = Lower Columbia River ESU - Tule fall Chinook salmon
LCR - Late run fall = Lower Columbia River ESU - Late-run bright fall Chinook salmon

Table 7b. Juvenile Chinook salmon collection at each of eight mainstem collection facilities in 2006 under a transportation with spill scenario.

Transportation with Spill Scenario

Chinook salmon

	Yearlings	Subyearlings
Total fish collected at:*		
Lower Granite	3,776,000	1,402,842
Little Goose	2,115,037	482,673
Lower Monumental	1,015,940	257,132
Ice Harbor**	1,031,261	118,863
Columbia River		
Wells***	2,791,961	NA
Rocky Reach***	3,421,048	NA
Rock Island***	6,215,468	NA
Wanapum***	5,593,921	NA
Priest Rapids***	5,034,529	NA
McNary****	3,991,244	8,683,433
John Day** ****	1,618,114	2,295,752
The Dalles** ****	4,204,443	1,430,078
Bonneville (I & II combined)** *****	2,315,994	6,540,064
---To the tailrace of Bonneville	13,159,057	26,913,844
---To Tongue Point*****	38,832,655	89,791,172

	Spring/Summer			Fall Chinook - Yearlings		Fall Chinook - Subyearlings		
		Hatchery		Hatchery			Hatchery	
Total listed fish at:	Wild	Ad-clip	No Ad-clip	Ad-clip	No Ad-clip	Wild	Ad-clip	No Ad-clip
Lower Granite	814,344	965,623	26,403	82,797	86,739	190,834	651,955	560,052
Little Goose	457,811	540,926	14,610	45,816	47,997	65,660	224,317	192,696
Lower Monumental	177,515	267,179	4,947	177,512	16,251	38,081	156,831	62,220
Ice Harbor**	179,449	270,092	4,749	170,412	15,601	17,603	72,497	28,762
Columbia River								
Wells***	83,363	50,517	391,000	0	0	NA	NA	NA
Rocky Reach***	164,802	124,983	512,210	0	0	NA	NA	NA
Rock Island***	561,572	562,485	460,989	0	0	NA	NA	NA
Wanapum***	505,415	506,237	414,890	0	0	NA	NA	NA
Priest Rapids***	454,874	455,613	373,401	0	0	NA	NA	NA
McNary****	263,961	317,109	133,499	99,435	9,103	14,112	58,118	23,058
John Day** ****	89,774	107,850	45,403	33,818	3,096	3,437	14,157	5,617
The Dalles** ****	219,855	264,122	111,191	82,820	7,582	2,141	8,819	3,499
Bonneville (I & II combined)** *****	87,063	104,592	44,032	32,797	3,002	396,098	3,542,079	111,901
---To the tailrace of Bonneville	494,676	594,273	250,182	186,347	17,057	1,630,033	14,576,457	460,498
---To Tongue Point*****	10,309,209	2,346,779	296,142	492,472	168,044	23,877,468	23,355,178	16,979,524
Percent listed fish at:								
Lower Granite	21.57%	25.57%	0.70%	2.19%	2.30%	13.60%	46.47%	39.92%
Little Goose	21.65%	25.58%	0.69%	2.17%	2.27%	13.60%	46.47%	39.92%
Lower Monumental	17.47%	26.30%	0.49%	17.47%	1.60%	14.81%	60.99%	24.20%
Ice Harbor**	17.40%	26.19%	0.46%	16.52%	1.51%	14.81%	60.99%	24.20%
Columbia River								
Wells***	2.99%	1.81%	14.00%	0.00%	0.00%	NA	NA	NA
Rocky Reach***	4.82%	3.65%	14.97%	0.00%	0.00%	NA	NA	NA
Rock Island***	9.04%	9.05%	7.42%	0.00%	0.00%	NA	NA	NA
Wanapum***	9.04%	9.05%	7.42%	0.00%	0.00%	NA	NA	NA
Priest Rapids***	9.04%	9.05%	7.42%	0.00%	0.00%	NA	NA	NA
McNary****	6.61%	7.95%	3.34%	2.49%	0.23%	0.16%	0.67%	0.27%
John Day** ****	5.55%	6.67%	2.81%	2.09%	0.19%	0.15%	0.62%	0.24%
The Dalles** ****	5.23%	6.28%	2.64%	1.97%	0.18%	0.15%	0.62%	0.24%
Bonneville (I & II combined)** *****	3.76%	4.52%	1.90%	1.42%	0.13%	6.06%	54.16%	1.71%
---To the tailrace of Bonneville	3.76%	4.52%	1.90%	1.42%	0.13%	6.06%	54.16%	1.71%
---To Tongue Point*****	26.55%	6.04%	0.76%	1.27%	0.43%	26.59%	26.01%	18.91%

* Note: "Total fish collected at:" is the total number of fish collected of that species or run, regardless of rearing type.

** Note: These dams have no transportation facilities, therefore, no fish are removed from the river at these dams.

*** Note: The numbers shown for these dams represent the number of fish arriving at the dam, not the number collected; FGE's at these dams are not currently established. Also, there is no transportation from these dams.

**** Note: (See next page)

***** Note: (See next page)

**** Note: The percentage of listed wild and hatchery spring/summer and fall Chinook salmon at McNary, John Day, and The Dalles Dams are:
For example, If you handle 1,000 yearling Chinook salmon at Tongue Point, under the Transportation with spill scenario (above), 26.93% of them will be listed wild fish, or 269 fish. To these 269 fish, apply the percentages listed below under the Tongue Point section to determine how many are from each ESU (SR, 269 x 0.1557 = 42; UCR, 269 x 0.0285 = 8; etc).

Yearling Chinook salmon	**Transportation with spill**		
		Hatchery	
	Wild	**Ad-clip**	**No Ad-clip**
SR - Spr/Sum	39.67	37.80	1.90
SR - Fall (Yrlg)	0.00	23.90	6.40
UCR	60.33	38.30	91.70
LCR - Spring	0.00	0.00	0.00
UWR	0.00	0.00	0.00
Subyearling Chinook salmon			
SR - Fall (Subyrlg)	100.00	100.00	100.00
LCR - Tule fall	0.00	0.00	0.00
LCR - Late run fall	0.00	0.00	0.00

***** Note: Because the Columbia River is a free flowing river below Bonneville Dam and there are no survival estimates available, survival was set at 100% to Tongue Point.
The percentage of listed wild and hatchery spring/summer and fall Chinook salmon at and downstream of Bonneville Dam are:

Bonneville Dam

Yearling Chinook salmon	**Transportation with spill**		
		Hatchery	
	Wild	**Ad-clip**	**No Ad-clip**
SR - Spr/Sum	30.49	37.80	1.90
SR - Fall (Yrlg)	0.00	23.90	6.40
UCR	46.37	38.30	91.70
LCR - Spring	23.13	0.00	0.00
UWR	0.00	0.00	0.00
Subyearling Chinook salmon			
SR - Fall (Subyrlg)	0.39	0.18	2.28
LCR - Tule fall	99.61	99.82	97.72
LCR - Late run fall	0.00	0.00	0.00

Tongue Point

Yearling Chinook salmon	**Transportation with spill**		
		Hatchery	
	Wild	**Ad-clip**	**No Ad-clip**
SR - Spr/Sum	15.57	18.30	4.80
SR - Fall (Yrlg)	0.00	4.40	15.80
UCR	2.85	2.70	23.00
LCR - Spring	15.40	23.20	42.20
UWR	66.17	51.40	14.20
Subyearling Chinook salmon			
SR - Fall (Subyrlg)	1.32	4.79	5.00
LCR - Tule fall	76.74	95.21	95.00
LCR - Late run fall	21.94	0.00	0.00

SR - Spr/Sum = Snake River ESU - Spring/Summer Chinook salmon
SR - Fall (Yrlg) = Snake River ESU - Yearling Fall Chinook salmon
SR - Fall (Subyrlg) = Snake River ESU - Subyearling Fall Chinook salmon
UCR = Upper Columbia River ESU
LCR - Spring = Lower Columbia River ESU - Spring Chinook
UWR = Upper Willamette River ESU

LCR - Tule fall = Lower Columbia River ESU - Tule fall Chinook salmon
LCR - Late run fall = Lower Columbia River ESU - Late-run bright fall Chinook salmon

Table 7c. Juvenile sockeye, coho, and chum salmon collection at each of eight mainstem collection facilities in 2006 under full transportation and transportation with spill scenarios.

	Full Transportation Scenario					Transportation with Spill Scenario				
	Sockeye salmon	Coho salmon			Chum salmon	Sockeye salmon	Coho salmon			Chum salmon
Total fish collected at:*										
Lower Granite	27,050	300,492			0	15,238	221,863			0
Little Goose	10,550	117,192			0	12,195	122,769			0
Lower Monumental	2,556	28,397			0	5,187	41,567			0
Ice Harbor**	1,380	15,334			0	4,326	39,904			0
Columbia River										
Wells***	NA	359,720			0	NA	359,720			0
Rocky Reach***	NA	323,748			0	NA	323,748			0
Rock Island***	NA	1,587,285			0	NA	1,587,285			0
Wanapum***	NA	1,428,557			0	NA	1,428,557			0
Priest Rapids***	NA	1,285,701			0	NA	1,285,701			0
McNary****	536,894	1,561,454			0	536,894	773,593			0
John Day** ****	989,497	1,953,981			0	201,198	483,601			0
The Dalles** ****	593,698	1,172,389			0	593,699	1,184,329			0
Bonneville (I & II combined)** *****	534,328	2,708,796			12,000	237,776	1,196,598			12,000
---To the tailrace of Bonneville	1,335,820	6,771,990			30,000	1,335,820	6,798,852			30,000
---To Tongue Point*****	1,375,976	19,768,261			1,607,982	1,368,440	18,360,241			1,607,982
		Coho salmon					Coho salmon			
	Sockeye		Hatchery		Chum	Sockeye		Hatchery		Chum
Total listed fish at:	salmon	Wild	Ad-clip	No Ad-clip	salmon	salmon	Wild	Ad-clip	No Ad-clip	salmon
Lower Granite	27,020	0	0	0	0	15,221	0	0	0	0
Little Goose	10,538	0	0	0	0	12,181	0	0	0	0
Lower Monumental	2,553	0	0	0	0	5,181	0	0	0	0
Ice Harbor**	1,379	0	0	0	0	4,321	0	0	0	0
Columbia River										
Wells***	NA	0	0	0	0	NA	0	0	0	0
Rocky Reach***	NA	0	0	0	0	NA	0	0	0	0
Rock Island***	NA	0	0	0	0	NA	0	0	0	0
Wanapum***	NA	0	0	0	0	NA	0	0	0	0
Priest Rapids***	NA	0	0	0	0	NA	0	0	0	0
McNary****	1,655	0	0	0	0	1,899	0	0	0	0
John Day** ****	1,117	0	0	0	0	712	0	0	0	0
The Dalles** ****	670	0	0	0	0	2,101	0	0	0	0
Bonneville (I & II combined)** *****	603	37,646	0	0	12,000	841	16,564	0	0	12,000
---To the tailrace of Bonneville	1,508	94,115	0	0	30,000	4,725	94,114	0	0	30,000
---To Tongue Point*****	43,274	1,199,305	10,070,000	1,455,500	1,607,982	37,308	1,199,304	10,070,000	1,455,500	1,607,982
Percent listed fish at:										
Lower Granite	99.89%	0.00%	0.00%	0.00%	----	99.89%	0.00%	0.00%	0.00%	----
Little Goose	99.89%	0.00%	0.00%	0.00%	----	99.89%	0.00%	0.00%	0.00%	----
Lower Monumental	99.88%	0.00%	0.00%	0.00%	----	99.88%	0.00%	0.00%	0.00%	----
Ice Harbor**	99.93%	0.00%	0.00%	0.00%	----	99.88%	0.00%	0.00%	0.00%	----
Columbia River		0.00%	0.00%	0.00%			0.00%	0.00%	0.00%	
Wells***	NA	0.00%	0.00%	0.00%	----	NA	0.00%	0.00%	0.00%	----
Rocky Reach***	NA	0.00%	0.00%	0.00%	----	NA	0.00%	0.00%	0.00%	----
Rock Island***	NA	0.00%	0.00%	0.00%	----	NA	0.00%	0.00%	0.00%	----
Wanapum***	NA	0.00%	0.00%	0.00%	----	NA	0.00%	0.00%	0.00%	----
Priest Rapids***	NA	0.00%	0.00%	0.00%	----	NA	0.00%	0.00%	0.00%	----
McNary****	0.31%	0.00%	0.00%	0.00%	----	0.35%	0.00%	0.00%	0.00%	----
John Day** ****	0.11%	0.00%	0.00%	0.00%	----	0.35%	0.00%	0.00%	0.00%	----
The Dalles** ****	0.11%	0.00%	0.00%	0.00%	----	0.35%	0.00%	0.00%	0.00%	----
Bonneville (I & II combined)** *****	0.11%	1.39%	0.00%	0.00%	----	0.35%	1.38%	0.00%	0.00%	----
---To the tailrace of Bonneville	0.11%	1.39%	0.00%	0.00%	100.00%	0.35%	1.38%	0.00%	0.00%	100.00%
---To Tongue Point*****	3.14%	6.07%	50.94%	7.36%	100.00%	2.73%	6.53%	54.85%	7.93%	100.00%

* Note: "Total fish collected at:" is the total number of fish collected of that species or run, regardless of rearing type.
** Note: These dams have no transportation facilities, therefore, no fish are removed from the river at these dams.
*** Note: The numbers shown for these dams represent the number of fish arriving at the dam, not the number collected; FGE's at these dams are not currently established. Also, there is no transportation from these dams.

Table 8a. Juvenile salmon collection at each of the mainstem collection facilities in 2006 under a full transportation scenario. Percentage of listed fish at each facility.

****Use this table only if the reartype and/or clip/no-clip status of all handled fish is known****

	Full Transportation Scenario									
	Yearling Chinook salmon				Coho salmon			Subyearling Chinook salmon		
	Unclipped			Clipped		Unclipped	Clipped	Unclipped		Clipped
Total fish collected at:*										
Lower Granite	1,288,792			3,825,430		259,692	40,800	795,738		690,896
Little Goose	515,574			1,525,011		84,400	13,260	292,976		254,375
Lower Monumental	159,902			773,043		17,042	2,678	74,595		130,875
Ice Harbor**	98,895			480,915		7,669	1,205	37,764		66,255
Columbia River										
Wells***	474,363			1,209,582		359,720	0	NA		NA
Rocky Reach***	677,012			1,586,512		323,748	0	NA		NA
Rock Island***	1,022,561			3,408,235		1,587,285	0	NA		NA
Wanapum***	920,305			3,067,412		1,428,557	0	NA		NA
Priest Rapids***	828,275			2,760,671		1,285,701	0	NA		NA
McNary****	3,247,942			3,377,710		1,141,760	407,682	11,175,084		559,426
John Day** ****	2,475,794			3,060,525		1,625,688	320,185	1,579,555		289,073
The Dalles** ****	1,599,192			1,964,315		975,413	192,111	846,190		154,861
Bonneville (I & II combined)** *****	1,498,824			2,991,250		2,107,517	596,900	2,388,654		5,299,375
---To the tailrace of Bonneville	3,747,060			7,478,125		5,268,793	1,492,250	7,962,180		17,664,583
---To Tongue Point*****	17,888,081			26,592,608		10,058,377	13,401,670	64,489,321		27,162,655
	Spring/Summer Chinook		Fall Chinook	Spring/Summer Chinook	Fall Chinook	Coho salmon		Coho salmon	Fall Chinook		Fall Chinook
		Hatchery	Hatchery	Hatchery	Hatchery	Wild	Hatchery	Hatchery	Wild	Hatchery	Hatchery
Total listed fish at:	Wild	No Ad-clip	No Ad-clip	Ad-clip	Ad-clip	No Ad-clip	No Ad-clip	Ad-clip	No Ad-clip	No Ad-clip	Ad-clip
Lower Granite	1,102,949	35,760	117,480	1,307,842	112,140	0	0	0	202,232	593,505	690,896
Little Goose	443,095	13,946	45,817	521,932	43,735	0	0	0	74,458	218,518	254,375
Lower Monumental	142,340	3,379	11,102	248,178	235,597	0	0	0	30,892	43,704	130,875
Ice Harbor**	89,412	1,825	5,995	152,204	127,222	0	0	0	15,639	22,125	66,255
Columbia River											
Wells***	83,363	391,000	0	50,517	0	0	0	0	NA	NA	NA
Rocky Reach***	164,802	512,210	0	124,983	0	0	0	0	NA	NA	NA
Rock Island***	561,572	460,989	0	562,485	0	0	0	0	NA	NA	NA
Wanapum***	505,415	414,890	0	506,237	0	0	0	0	NA	NA	NA
Priest Rapids***	454,874	373,401	0	455,613	0	0	0	0	NA	NA	NA
McNary****	434,803	271,041	7,194	510,688	152,667	0	0	0	16,942	23,969	71,777
John Day** ****	293,492	182,953	4,856	344,714	103,050	0	0	0	2,395	3,388	10,145
The Dalles** ****	176,095	109,772	2,914	206,828	61,830	0	0	0	1,283	1,815	5,435
Bonneville (I & II combined)** *****	158,486	98,795	2,623	186,145	55,647	37,646	0	0	488,237	136,634	4,369,892
---To the tailrace of Bonneville	396,215	246,988	6,558	465,363	139,118	94,115	0	0	1,627,457	455,447	14,566,307
---To Tongue Point*****	10,436,143	300,073	180,957	2,506,354	530,590	1,199,305	1,455,500	10,070,000	23,890,729	17,016,143	23,401,730
Percent listed fish at:											
Lower Granite	85.58%	2.77%	9.12%	34.188%	2.931%	0.00%	0.00%	0.00%	25.41%	74.59%	100.00%
Little Goose	85.94%	2.70%	8.89%	34.225%	2.868%	0.00%	0.00%	0.00%	25.41%	74.59%	100.00%
Lower Monumental	89.02%	2.11%	6.94%	32.104%	30.477%	0.00%	0.00%	0.00%	41.41%	58.59%	100.00%
Ice Harbor**	90.41%	1.85%	6.06%	31.649%	26.454%	0.00%	0.00%	0.00%	41.41%	58.59%	100.00%
Columbia River											
Wells***	17.57%	82.43%	0.00%	4.18%	0.00%	NA	NA	NA	NA	NA	NA
Rocky Reach***	24.34%	75.66%	0.00%	7.88%	0.00%	NA	NA	NA	NA	NA	NA
Rock Island***	54.92%	45.08%	0.00%	16.50%	0.00%	NA	NA	NA	NA	NA	NA
Wanapum***	54.92%	45.08%	0.00%	16.50%	0.00%	NA	NA	NA	NA	NA	NA
Priest Rapids***	54.92%	45.08%	0.00%	16.50%	0.00%	NA	NA	NA	NA	NA	NA
McNary****	13.39%	8.35%	0.22%	15.12%	4.52%	0.00%	0.00%	0.00%	0.15%	0.21%	12.83%
John Day** ****	11.85%	7.39%	0.20%	11.26%	3.37%	0.00%	0.00%	0.00%	0.15%	0.21%	3.51%
The Dalles** ****	11.01%	6.86%	0.18%	10.53%	3.15%	0.00%	0.00%	0.00%	0.15%	0.21%	3.51%
Bonneville (I & II combined)** *****	10.57%	6.59%	0.18%	6.22%	1.86%	1.79%	0.00%	0.00%	20.44%	5.72%	82.46%
---To the tailrace of Bonneville	10.57%	6.59%	0.18%	6.22%	1.86%	1.79%	0.00%	0.00%	20.44%	5.72%	82.46%
---To Tongue Point*****	58.34%	1.68%	1.01%	9.43%	2.00%	11.92%	14.47%	75.14%	37.05%	26.39%	86.15%

* Note: "Total fish collected at:" is the total number of fish collected of that species or run, regardless of rearing type.
** Note: These dams have no transportation facilities, therefore, no fish are removed from the river at these dams.
*** Note: The numbers shown for these dams represent the number of fish arriving at the dam, not the number collected; FGE's at these dams are not currently established. Also, there is no transportation from these dams.
**** Note: (See next page)
***** Note: (See next page)

**** Note: The percentage of listed wild and hatchery spring/summer and fall Chinook salmon at McNary, John Day, and The Dalles Dams are:
For example, If you handle 1,000 yearling Chinook salmon at Tongue Point, under the Full Transportation scenario (above), 59.17% of them will be listed wild fish, or 592 fish. To these 592 fish, apply the percentages listed below under the Tongue Point section to determine how many are from each ESU (SR, 592 x 0.1658 = 98; UCR, 592 x 0.0282 = 17; etc).

Spring/Summer Chinook salmon	**Full Transportation Hatchery**		
	Wild	**Ad-clip**	**No Ad-clip**
SR	24.68	27.50	0.80
UCR	75.32	49.50	96.60
LCR - Spring	0.00	0.00	0.00
UWR	0.00	0.00	0.00
Fall Chinook salmon			
SR	100.00	100.00	100.00
LCR - Tule fall	0.00	0.00	0.00
LCR - Late run fall	0.00	0.00	0.00

***** Note: Because the Columbia River is a free flowing river below Bonneville Dam and there are no survival estimates available, survival was set at 100% to Tongue Point.
The percentage of listed wild and hatchery spring/summer and fall Chinook salmon at and downstream of Bonneville Dam are:

Bonneville Dam Spring/Summer Chinook salmon	**Full Transportation Hatchery**		
	Wild	**Ad-clip**	**No Ad-clip**
SR	17.94	27.50	0.80
UCR	54.75	49.50	96.60
LCR - Spring	27.31	0.00	0.00
UWR	0.00	0.00	0.00
Fall Chinook salmon			
SR	0.24	0.11	1.20
LCR - Tule fall	99.76	99.89	98.80
LCR - Late run fall	0.00	0.00	0.00

Tongue Point Spring/Summer Chinook salmon	**Full Transportation Hatchery**		
	Wild	**Ad-clip**	**No Ad-clip**
SR	16.58	19.40	5.10
UCR	2.82	2.60	22.60
LCR - Spring	15.22	22.80	41.60
UWR	65.38	50.50	14.00
Fall Chinook salmon			
SR	1.37	4.97	5.20
LCR - Tule fall	76.70	95.03	94.80
LCR - Late run fall	21.93	0.00	0.00

SR = Snake River ESU
UCR = Upper Columbia River ESU
LCR - Spring = Lower Columbia River ESU - Spring Chinook
UWR = Upper Willamette River ESU

LCR - Tule fall = Lower Columbia River ESU - Tule fall Chinook salmon
LCR - Late run fall = Lower Columbia River ESU - Late-run bright fall Chinook salmon

Table 8b. Juvenile salmon collection at each of the mainstem collection facilities in 2006 under a transportation with spill scenario. Percentage of listed fish at each facility.

****Use this table only if the reartype and/or clip/no-clip status of all handled fish is known****

	Transportation with Spill Scenario									
	Yearling Chinook salmon				Coho salmon			Subyearling Chinook salmon		
	Unclipped			Clipped		Unclipped	Clipped	Unclipped		Clipped
Total fish collected at:*										
Lower Granite	951,558			2,824,442		191,739	30,124	750,887		651,955
Little Goose	533,739			1,581,298		88,416	13,891	258,356		224,317
Lower Monumental	203,223			812,717		24,946	3,919	100,302		156,831
Ice Harbor**	204,129			827,132		19,957	3,135	46,366		72,497
Columbia River										
Wells***	474,363			1,209,582		359,720	0	NA		NA
Rocky Reach***	677,012			1,586,512		323,748	0	NA		NA
Rock Island***	1,022,561			3,408,235		1,587,285	0	NA		NA
Wanapum***	920,305			3,067,412		1,428,557	0	NA		NA
Priest Rapids***	828,275			2,760,671		1,285,701	0	NA		NA
McNary****	1,640,716			1,844,428		559,483	198,911	8,269,463		413,970
John Day** ****	627,453			818,535		399,757	78,675	2,014,315		281,437
The Dalles** ****	1,650,335			2,132,576		978,997	192,673	1,254,764		175,314
Bonneville (I & II combined)** *****	679,735			1,382,781		928,727	262,859	2,232,660		4,307,404
---To the tailrace of Bonneville	3,862,131			7,856,710		5,276,858	1,493,517	9,187,901		17,725,942
---To Tongue Point*****	16,149,111			24,661,956		9,428,132	13,185,362	62,755,657		27,035,515
	Spring/Summer Chinook		Fall Chinook	Spring/Summer Chinook	Fall Chinook	Coho salmon		Coho salmon	Fall Chinook		Fall Chinook
Total listed fish at:	Wild	Hatchery No Ad-clip	Hatchery No Ad-clip	Hatchery Ad-clip	Hatchery Ad-clip	Wild No Ad-clip	Hatchery No Ad-clip	Hatchery Ad-clip	Wild No Ad-clip	Hatchery No Ad-clip	Hatchery Ad-clip
Lower Granite	814,344	26,403	86,739	965,623	82,797	0	0	0	190,834	560,052	651,955
Little Goose	457,811	14,610	47,997	540,926	45,816	0	0	0	65,660	192,696	224,317
Lower Monumental	177,515	4,947	16,251	267,179	177,512	0	0	0	38,081	62,220	156,831
Ice Harbor**	179,449	4,749	15,601	270,092	170,412	0	0	0	17,603	28,762	72,497
Columbia River											
Wells***	83,363	391,000	0	50,517	0	0	0	0	NA	NA	NA
Rocky Reach***	164,802	512,210	0	124,983	0	0	0	0	NA	NA	NA
Rock Island***	561,572	460,989	0	562,485	0	0	0	0	NA	NA	NA
Wanapum***	505,415	414,890	0	506,237	0	0	0	0	NA	NA	NA
Priest Rapids***	454,874	373,401	0	455,613	0	0	0	0	NA	NA	NA
McNary****	263,961	133,499	9,103	317,109	99,435	0	0	0	14,112	23,058	58,118
John Day** ****	89,774	45,403	3,096	107,850	33,818	0	0	0	3,437	5,617	14,157
The Dalles** ****	219,855	111,191	7,582	264,122	82,820	0	0	0	2,141	3,499	8,819
Bonneville (I & II combined)** *****	87,063	44,032	3,002	104,592	32,797	16,564	0	0	396,098	111,901	3,542,079
---To the tailrace of Bonneville	494,676	250,182	17,057	594,273	186,347	94,114	0	0	1,630,033	460,498	14,576,457
---To Tongue Point*****	10,309,209	296,142	168,044	2,346,779	492,472	1,199,304	1,455,500	10,070,000	23,877,468	16,979,524	23,355,178
Percent listed fish at:											
Lower Granite	85.58%	2.77%	9.12%	34.19%	2.93%	0.00%	0.00%	0.00%	25.41%	74.59%	100.00%
Little Goose	85.77%	2.74%	8.99%	34.21%	2.90%	0.00%	0.00%	0.00%	25.41%	74.59%	100.00%
Lower Monumental	87.35%	2.43%	8.00%	32.88%	21.84%	0.00%	0.00%	0.00%	37.97%	62.03%	100.00%
Ice Harbor**	87.91%	2.33%	7.64%	32.65%	20.60%	0.00%	0.00%	0.00%	37.97%	62.03%	100.00%
Columbia River											
Wells***	17.57%	82.43%	0.00%	4.18%	0.00%	NA	NA	NA	NA	NA	NA
Rocky Reach***	24.34%	75.66%	0.00%	7.88%	0.00%	NA	NA	NA	NA	NA	NA
Rock Island***	54.92%	45.08%	0.00%	16.50%	0.00%	NA	NA	NA	NA	NA	NA
Wanapum***	54.92%	45.08%	0.00%	16.50%	0.00%	NA	NA	NA	NA	NA	NA
Priest Rapids***	54.92%	45.08%	0.00%	16.50%	0.00%	NA	NA	NA	NA	NA	NA
McNary****	16.09%	8.14%	0.55%	17.19%	5.39%	0.00%	0.00%	0.00%	0.17%	0.28%	14.04%
John Day** ****	14.31%	7.24%	0.49%	13.18%	4.13%	0.00%	0.00%	0.00%	0.17%	0.28%	5.03%
The Dalles** ****	13.32%	6.74%	0.46%	12.39%	3.88%	0.00%	0.00%	0.00%	0.17%	0.28%	5.03%
Bonneville (I & II combined)** *****	12.81%	6.48%	0.44%	7.56%	2.37%	1.78%	0.00%	0.00%	17.74%	5.01%	82.23%
---To the tailrace of Bonneville	12.81%	6.48%	0.44%	7.56%	2.37%	1.78%	0.00%	0.00%	17.74%	5.01%	82.23%
---To Tongue Point*****	63.84%	1.83%	1.04%	9.52%	2.00%	12.72%	15.44%	76.37%	38.05%	27.06%	86.39%

* Note: "Total fish collected at:" is the total number of fish collected of that species or run, regardless of rearing type.
** Note: These dams have no transportation facilities, therefore, no fish are removed from the river at these dams.
*** Note: The numbers shown for these dams represent the number of fish arriving at the dam, not the number collected; FGE's at these dams are not currently established. Also, there is no transportation from these dams.
**** Note: (See next page)
***** Note: (See next page)

**** Note: The percentage of listed wild and hatchery spring/summer and fall Chinook salmon at McNary, John Day, and The Dalles Dams are:
For example, If you handle 1,000 yearling Chinook salmon at Tongue Point, under the Transportation with spill scenario (above), 64.76% of them will be listed wild fish, or 648 fish. To these 648 fish, apply the percentages listed below under the Tongue Point section to determine how many are from each ESU (SR, 648 x 0.1557 = 101; UCR, 648 x 0.0285 = 18; etc).

Spring/Summer Chinook salmon	**Transportation with spill**		
		Hatchery	
	Wild	**Ad-clip**	**No Ad-clip**
SR	39.67	37.80	1.90
UCR	60.33	38.30	91.70
LCR - Spring	0.00	0.00	0.00
UWR	0.00	0.00	0.00
Fall Chinook salmon			
SR	100.00	100.00	100.00
LCR - Tule fall	0.00	0.00	0.00
LCR - Late run fall	0.00	0.00	0.00

***** Note: Because the Columbia River is a free flowing river below Bonneville Dam and there are no survival estimates available, survival was set at 100% to Tongue Point.
The percentage of listed wild and hatchery spring/summer and fall Chinook salmon at and downstream of Bonneville Dam are:

Bonneville Dam

Spring/Summer Chinook salmon	**Transportation with spill**		
		Hatchery	
	Wild	**Ad-clip**	**No Ad-clip**
SR	30.49	37.80	1.90
UCR	46.37	38.30	91.70
LCR - Spring	23.13	0.00	0.00
UWR	0.00	0.00	0.00
Fall Chinook salmon			
SR	0.39	0.18	2.28
LCR - Tule fall	99.61	99.82	97.72
LCR - Late run fall	0.00	0.00	0.00

Tongue Point

Spring/Summer Chinook salmon	**Transportation with spill**		
		Hatchery	
	Wild	**Ad-clip**	**No Ad-clip**
SR	15.57	18.30	4.80
UCR	2.85	2.70	23.00
LCR - Spring	15.40	23.20	42.20
UWR	66.17	51.40	14.20
Fall Chinook salmon			
SR	1.32	4.79	5.00
LCR - Tule fall	76.74	95.21	95.00
LCR - Late run fall	21.94	0.00	0.00

SR = Snake River ESU
UCR = Upper Columbia River ESU
LCR - Spring = Lower Columbia River ESU - Spring Chinook
UWR = Upper Willamette River ESU

LCR - Tule fall = Lower Columbia River ESU - Tule fall Chinook salmon
LCR - Late run fall = Lower Columbia River ESU - Late-run bright fall Chinook salmon

Table 9. Juvenile steelhead trout collection at each of the mainstem collection facilities in 2006 under full transportation and transportation with spill scenarios.

	Full Transportation Scenario			**Transportation with SpillScenario**		
	Steelhead trout			Steelhead trout		
Total fish collected at:*						
Snake River						
Lower Granite	6,467,494			4,042,184		
Little Goose	1,337,049			2,091,276		
Lower Monumental	284,976			819,408		
Ice Harbor**	133,808			609,099		
Columbia River						
Wells***	594,728			594,728		
Rocky Reach***	566,608			566,608		
Rock Island***	932,546			932,546		
Wanapum***	839,291			839,291		
Priest Rapids***	755,362			755,362		
McNary****	1,335,683			423,071		
John Day** ****	1,234,658			578,227		
The Dalles** ****	1,239,283			1,469,992		
Bonneville (I & II combined)** *****	1,370,285			552,273		
---To the tailrace of Bonneville	2,491,427			2,906,700		
---To Tongue Point****	14,963,344			14,278,819		
	Steelhead trout			Steelhead trout		
Total listed fish at:		Hatchery			Hatchery	
Snake River	Wild	Ad-clip	No Ad-clip	Wild	Ad-clip	No Ad-clip
Lower Granite	867,188	2,259,639	413,629	541,993	1,412,275	258,518
Little Goose	180,034	469,217	83,760	280,778	731,663	133,085
Lower Monumental	37,417	43,535	47,044	107,436	245,152	74,507
Ice Harbor**	23,356	26,060	17,099	84,285	183,351	53,403
Columbia River						
Wells***	61,761	482,126	44,739	61,761	482,126	44,739
Rocky Reach***	70,168	450,683	40,265	70,168	450,683	40,265
Rock Island***	80,950	669,165	177,488	80,950	669,165	177,488
Wanapum***	72,855	602,249	159,739	72,855	602,249	159,739
Priest Rapids***	65,570	542,024	143,765	65,570	542,024	143,765
McNary****	163,995	562,081	214,442	52,597	167,537	58,058
John Day** ****	274,476	533,457	150,109	116,308	236,717	64,427
The Dalles** ****	539,023	425,937	96,499	568,631	502,381	114,142
Bonneville (I & II combined)** *****	569,777	421,678	95,534	206,958	171,814	39,037
---To the tailrace of Bonneville	1,035,958	766,687	173,698	1,089,253	904,284	205,458
---To Tongue Point****	2,876,506	3,513,646	718,131	2,784,435	3,281,058	671,568
Percent listed fish at:						
Snake River						
Lower Granite	13.41%	34.94%	6.40%	13.41%	34.94%	6.40%
Little Goose	13.47%	35.09%	6.27%	13.43%	34.99%	6.36%
Lower Monumental	13.13%	15.28%	16.51%	13.11%	29.92%	9.09%
Ice Harbor**	17.46%	19.48%	12.78%	13.84%	30.10%	8.77%
Columbia River						
Wells***	10.39%	81.07%	7.52%	10.39%	81.07%	7.52%
Rocky Reach***	12.38%	79.54%	7.11%	12.38%	79.54%	7.11%
Rock Island***	8.68%	71.76%	19.03%	8.68%	71.76%	19.03%
Wanapum***	8.68%	71.76%	19.03%	8.68%	71.76%	19.03%
Priest Rapids***	8.68%	71.76%	19.03%	8.68%	71.76%	19.03%
McNary****	12.28%	42.08%	16.06%	12.43%	39.60%	13.72%
John Day** ****	22.23%	43.21%	12.16%	20.12%	40.94%	11.14%
The Dalles** ****	43.50%	34.37%	7.79%	38.68%	34.18%	7.77%
Bonneville (I & II combined)** *****	41.58%	30.77%	6.97%	37.47%	31.11%	7.07%
---To the tailrace of Bonneville	41.58%	30.77%	6.97%	37.47%	31.11%	7.07%
---To Tongue Point****	19.22%	23.48%	4.80%	19.50%	22.98%	4.70%

* Note: "Total fish collected at:" is the total number of fish collected of that species or run, regardless of rearing type.

** Note: These dams have no transportation facilities, therefore, no fish are removed from the river at these dams.

*** Note: The numbers shown for these dams represent the number of fish arriving at the dam, not the number collected; FGE's at these dams are not currently established at this time. Also, there is no transportation from these dams.

**** Note: (See next page)

**** Note: The percentage of listed wild and hatchery fish from each ESU at each Columbia River dam from McNary Dam to Bonneville Dam and at Tongue Point.

For example, If you handle 1,000 steelhead at Tongue Point, under the Full Transportation with spill scenario (above), 19.50% of them will be listed wild fish, or 195 fish. To these 195 fish, apply the percentages listed below under the Tongue Point section to determine how many are from each ESU (SR, 195 x 0.3728 = 73; UCR, 195 x 0.0158 = 3; etc).

	Full Transportation			Transportation with spill		
		Hatchery			Hatchery	
McNary Dam	**Wild**	**AD-clipped**	**No AD-clip**	**Wild**	**AD-clipped**	**No AD-clip**
SR	15.38	5.01	8.61	39.61	27.05	22.74
UCR	32.39	81.38	69.98	23.11	62.50	59.17
MCR - Summer	52.23	13.61	21.40	37.28	10.45	18.10
MCR - Winter	---	---	---	---	---	---
LCR - Summer	---	---	---	---	---	---
LCR - Winter	---	---	---	---	---	---
UWR - Summer	---	---	---	---	---	---
UWR - Winter	---	---	---	---	---	---
John Day Dam						
SR	6.83	3.69	8.61	20.92	21.25	22.74
UCR	14.38	60.02	69.98	12.21	49.08	59.17
MCR - Summer	78.79	29.72	21.40	66.87	24.30	18.10
MCR - Winter	---	6.56	0.00	---	5.37	0.00
LCR - Summer	---	---	---	---	---	---
LCR - Winter	---	---	---	---	---	---
UWR - Summer	---	---	---	---	---	---
UWR - Winter	---	---	---	---	---	---
The Dalles Dam						
SR	2.30	2.97	8.61	7.85	17.74	22.74
UCR	4.85	48.33	69.98	4.58	40.97	59.17
MCR - Summer	92.84	43.42	21.40	87.58	36.81	18.10
MCR - Winter	---	5.28	0.00	---	4.48	0.00
LCR - Summer	---	---	---	---	---	---
LCR - Winter	---	---	---	---	---	---
UWR - Summer	---	---	---	---	---	---
UWR - Winter	---	---	---	---	---	---
Bonneville Dam						
SR	2.15	2.83	8.61	7.33	16.99	22.74
UCR	4.52	45.93	69.98	4.28	39.24	59.17
MCR - Summer	86.43	41.26	21.40	81.85	35.25	18.10
MCR - Winter	1.74	5.02	0.00	1.65	4.29	0.00
LCR - Summer	2.28	4.96	0.00	2.16	4.24	0.00
LCR - Winter	2.88	0.00	0.00	2.73	0.00	0.00
UWR - Summer	---	---	---	---	---	---
UWR - Winter	---	---	---	---	---	---
Tongue Point						
SR	39.15	56.88	78.45	37.28	59.15	76.72
UCR	1.54	7.53	16.50	1.58	8.50	17.83
MCR - Summer	29.37	6.77	5.05	30.28	7.63	5.45
MCR - Winter	0.59	0.82	0.00	0.61	0.93	0.00
LCR - Summer	2.26	5.54	0.00	2.33	2.02	0.00
LCR - Winter	19.21	15.55	0.00	19.81	13.99	0.00
UWR - Summer	---	3.75	0.00	---	4.23	0.00
UWR - Winter	7.87	3.15	0.00	8.12	3.55	0.00

SR = Snake River ESU
UCR = Upper Columbia River ESU
MCR - Summer = Mid Columbia River ESU summer steelhead
MCR - Winter = Mid Columbia River ESU winter steelhead
LCR - Summer = Lower Columbia River ESU summer steelhead
LCR - Winter = Lower Columbia River ESU winter steelhead
UWR - Summer = Upper Willamette River ESU summer steelhead
UWR - Winter = Upper Willamette River ESU winter steelhead

Table 10. Juvenile steelhead trout collection at each of the mainstem collection facilities in 2006 under full transportation and transportation with spill scenarios. Percentage of listed fish by rearing type (wild or hatchery) at each facility.

****Use this table only if the reartype and/or clip/no-clip status of all handled fish is known****

	Full Transportation Scenario Steelhead trout			Transportation with Spill Scenario Steelhead trout		
	Unclipped		Clipped	Unclipped		Clipped
Total fish collected at:*						
Snake River						
Lower Granite	1,567,089		4,900,406	979,431		3,062,754
Little Goose	321,764		1,003,972	505,971		1,581,330
Lower Monumental	88,230		182,294	212,026		600,263
Ice Harbor**	41,824		76,494	159,250		437,878
Columbia River						
Wells***	106,500		488,228	106,500		488,228
Rocky Reach***	110,433		456,175	110,433		456,175
Rock Island***	258,438		674,108	258,438		674,108
Wanapum***	232,594		606,697	232,594		606,697
Priest Rapids***	209,335		546,027	209,335		546,027
McNary****	494,223		824,101	142,149		277,962
John Day** ****	505,636		716,871	215,685		359,257
The Dalles** ****	687,626		543,846	744,693		719,479
Bonneville (I & II combined)** *****	716,894		645,658	267,171		283,112
---To the tailrace of Bonneville	1,303,444		1,173,924	1,406,163		1,490,063
---To Tongue Point******	4,104,908		10,844,379	3,937,038		10,331,309
Total listed fish at: *Snake River*	Wild	Hatchery No Ad-clip	Hatchery Ad-clip	Wild	Hatchery No Ad-clip	Hatchery Ad-clip
Lower Granite	867,188	413,629	2,259,639	541,993	258,518	1,412,275
Little Goose	180,034	83,760	469,217	280,778	133,085	731,663
Lower Monumental	37,417	47,044	43,535	107,436	74,507	245,152
Ice Harbor**	23,356	17,099	26,060	84,285	53,403	183,351
Columbia River						
Wells***	61,761	44,739	482,126	61,761	44,739	482,126
Rocky Reach***	70,168	40,265	450,683	70,168	40,265	450,683
Rock Island***	80,950	177,488	669,165	80,950	177,488	669,165
Wanapum***	72,855	159,739	602,249	72,855	159,739	602,249
Priest Rapids***	65,570	143,765	542,024	65,570	143,765	542,024
McNary****	163,995	214,442	562,081	52,597	58,058	167,537
John Day** ****	274,476	150,109	533,457	116,308	64,427	236,717
The Dalles** ****	539,023	96,499	425,937	568,631	114,142	502,381
Bonneville (I & II combined)** *****	569,777	95,534	421,678	206,958	39,037	171,814
---To the tailrace of Bonneville	1,035,958	173,698	766,687	1,089,253	205,458	904,284
---To Tongue Point******	2,876,506	718,131	3,513,646	2,784,435	671,568	3,281,058
Percent listed fish at:						
Snake River						
Lower Granite	55.34%	26.39%	46.11%	55.34%	26.39%	46.11%
Little Goose	55.95%	26.03%	46.74%	55.49%	26.30%	46.27%
Lower Monumental	42.41%	53.32%	23.88%	50.67%	35.14%	40.84%
Ice Harbor**	55.84%	40.88%	34.07%	52.93%	33.53%	41.87%
Columbia River						
Wells***	57.99%	42.01%	98.75%	57.99%	42.01%	98.75%
Rocky Reach***	63.54%	36.46%	98.80%	63.54%	36.46%	98.80%
Rock Island***	31.32%	68.68%	99.27%	31.32%	68.68%	99.27%
Wanapum***	31.32%	68.68%	99.27%	31.32%	68.68%	99.27%
Priest Rapids***	31.32%	68.68%	99.27%	31.32%	68.68%	99.27%
McNary****	33.18%	43.39%	68.21%	37.00%	40.84%	60.27%
John Day** ****	54.28%	29.69%	74.42%	53.92%	29.87%	65.89%
The Dalles** ****	78.39%	14.03%	78.32%	76.36%	15.33%	69.83%
Bonneville (I & II combined)** *****	79.48%	13.33%	65.31%	77.46%	14.61%	60.69%
---To the tailrace of Bonneville	79.48%	13.33%	65.31%	77.46%	14.61%	60.69%
---To Tongue Point****	70.07%	17.49%	32.40%	70.72%	17.06%	31.76%

* Note: "Total fish collected at:" is the total number of fish collected of that species, run and rearing type.

** Note: These dams have no transportation facilities, therefore, no fish are removed from the river at these dams.

*** Note: The numbers shown for these dams represent the number of fish arriving at the dam, not the number collected; FGE's at these dams are not currently established. Also, there is no transportation from these dams.

**** Note: (See next page)

**** Note: The percentage of listed wild and hatchery fish from each ESU at each Columbia River dam from McNary Dam to Bonneville Dam and at Tongue Point.

For example, If you handle 1,000 steelhead at Tongue Point, under the Full Transportation with spill scenario (above), 70.72% of them will be listed wild fish, or 707 fish. To these 707 fish, apply the percentages listed below under the Tongue Point section to determine how many are from each ESU (SR, 707 x 0.3728 = 264; UCR, 707 x 0.0158 = 11; etc).

	Full Transportation			Transportation with spill		
		Hatchery			Hatchery	
McNary Dam	**Wild**	**AD-clipped**	**No AD-clip**	**Wild**	**AD-clipped**	**No AD-clip**
SR	15.38	5.01	8.61	39.61	27.05	22.74
UCR	32.39	81.38	69.98	23.11	62.50	59.17
MCR - Summer	52.23	13.61	21.40	37.28	10.45	18.10
MCR - Winter	---	---	---	---	---	---
LCR - Summer	---	---	---	---	---	---
LCR - Winter	---	---	---	---	---	---
UWR - Summer	---	---	---	---	---	---
UWR - Winter	---	---	---	---	---	---
John Day Dam						
SR	6.83	3.69	8.61	20.92	21.25	22.74
UCR	14.38	60.02	69.98	12.21	49.08	59.17
MCR - Summer	78.79	29.72	21.40	66.87	24.30	18.10
MCR - Winter	---	6.56	0.00	---	5.37	0.00
LCR - Summer	---	---	---	---	---	---
LCR - Winter	---	---	---	---	---	---
UWR - Summer	---	---	---	---	---	---
UWR - Winter	---	---	---	---	---	---
The Dalles Dam						
SR	2.30	2.97	8.61	7.85	17.74	22.74
UCR	4.85	48.33	69.98	4.58	40.97	59.17
MCR - Summer	92.84	43.42	21.40	87.58	36.81	18.10
MCR - Winter	---	5.28	0.00	---	4.48	0.00
LCR - Summer	---	---	---	---	---	---
LCR - Winter	---	---	---	---	---	---
UWR - Summer	---	---	---	---	---	---
UWR - Winter	---	---	---	---	---	---
Bonneville Dam						
SR	2.15	2.83	8.61	7.33	16.99	22.74
UCR	4.52	45.93	69.98	4.28	39.24	59.17
MCR - Summer	86.43	41.26	21.40	81.85	35.25	18.10
MCR - Winter	1.74	5.02	0.00	1.65	4.29	0.00
LCR - Summer	2.28	4.96	0.00	2.16	4.24	0.00
LCR - Winter	2.88	0.00	0.00	2.73	0.00	0.00
UWR - Summer	---	---	---	---	---	---
UWR - Winter	---	---	---	---	---	---
Tongue Point						
SR	39.15	56.88	78.45	37.28	59.15	76.72
UCR	1.54	7.53	16.50	1.58	8.50	17.83
MCR - Summer	29.37	6.77	5.05	30.28	7.63	5.45
MCR - Winter	0.59	0.82	0.00	0.61	0.93	0.00
LCR - Summer	2.26	5.54	0.00	2.33	2.02	0.00
LCR - Winter	19.21	15.55	0.00	19.81	13.99	0.00
UWR - Summer	---	3.75	0.00	---	4.23	0.00
UWR - Winter	7.87	3.15	0.00	8.12	3.55	0.00

SR = Snake River ESU
UCR = Upper Columbia River ESU
MCR - Summer = Mid Columbia River ESU summer steelhead
MCR - Winter = Mid Columbia River ESU winter steelhead
LCR - Summer = Lower Columbia River ESU summer steelhead
LCR - Winter = Lower Columbia River ESU winter steelhead
UWR - Summer = Upper Willamette River ESU summer steelhead
UWR - Winter = Upper Willamette River ESU winter steelhead

Table 11. Estimated number of listed fish outmigrating from each ESU, 2006.

ESU	Run	Number of listed fish[a] Wild	Hatchery AD-clipped	Hatchery Non-AD-clipped
Snake River				
Chinook	Spring/summer	1,838,248	4,593,570	109,200
	Fall			
	- subyearlings	367,696	2,991,500	2,398,000
	- yearlings		660,000	220,000
Steelhead	Summer	1,103,985	3,638,000	752,000
Sockeye		13,500	31,534	0
Upper Columbia				
Chinook	Spring	586,388	616,285	705,000
Steelhead	Summer	94,143	846,650	219,000
Mid-Columbia				
Steelhead	Summer	1,048,439	316,000	51,000
	Winter	16,557	0	0
Lower Columbia				
Chinook	Spring	1,477,003	2,604,000	450,000
	Fall (tule)	18,323,486	22,237,500	16,461,000
	Fall (late run)	5,238,871	0	0
Steelhead	Summer	63,418	88,000	0
	Winter	538,440	815,000	0
Coho		1,123,794	10,126,500	1,455,500
Upper Willamette				
Chinook	Spring	3,847,700	5,756,990	151,500
Steelhead	Summer		0	0
	Winter	220,642	0	0
Columbia River				
Chum		No estimate	0	515,000

[a] Listed hatchery numbers are release numbers.

Listed wild numbers are estimated total production for ESU.

Appendix A.

Determination of the effects of returning all PIT-tagged spring/summer Chinook salmon to the river at each collection dam on the number of fish that arrive at each subsequent dam

We surveyed researchers regarding the number of outmigrating PIT-tagged spring/summer Chinook salmon in the Snake River we could expect in 2006. We found that 286,000 hatchery fish will be PIT tagged and released above Lower Granite Dam as part of the Comparative Survival Study (CSS). We applied the hatchery survival estimates found in Table 1 to the fish released from hatcheries to determine the number of CSS hatchery fish that will arrive at Lower Granite Dam (188,151). The CSS requires that 70% of the fish collected at each of the Snake River collector dams be transported.

Another 37,838 hatchery spring/summer Chinook salmon (PIT tagged at hatcheries (not part of the CSS) and traps) will arrive at Lower Granite Dam. Of the 225,989 (188,151 + 37,838) hatchery fish reaching Lower Granite Dam, 87,982 will be listed hatchery fish. It is unknown whether the PIT-tagged hatchery fish will be ad-clipped or not, so, because ad-clipped hatchery fish constitute the vast majority of hatchery fish, all PIT-tagged fish are assumed to be ad-clipped for the following calculations.

Because tagging for the 2006 outmigration year began in July 2005 and continues throughout the outmigration year, we cannot accurately estimate survival from tagging of natural and migrating fish to the head of the Lower Granite Reservoir. We assumed that all of these fish would survive to the head of the reservoir, realizing that this is an overestimation. We chose the head of the reservoir because that is where the last of the tagging occurs, and because we have survival estimates from the head of the reservoir to the tailrace of Lower Granite Dam. It is expected that wild spring/summer Chinook salmon will be PIT tagged above Lower Granite Dam. Using 90% survival from tagging location through the Lower Granite Dam pool, 36,882 (40,980 x 0.90) will arrive at Lower Granite Dam.

National Marine Fisheries Service will be PIT-tagging fish at Lower Granite Dam during the 2006 outmigration. As part of this marking, 20,000 PIT-tagged wild and 229,598 PIT-tagged hatchery spring/summer Chinook salmon will be released into the Lower Granite Dam tailrace. As these fish move downstream, all of those collected at Little Goose and Lower Monumental Dams will be diverted back to the river. Another 71,475 PIT-tagged hatchery spring/summer Chinook salmon will be released below Ice Harbor Dam.

Approximately 4,400 fish (400 wild and 4,000 hatchery) will be released in the Tucannon River. These fish are assumed to arrive at Lower Monumental Dam with no mortality.

We performed two calculations to determine the expected number of PIT-tagged fish collected at each collector dam. The first calculation made use of the same formulas used under the "Transportation with Spill" and "Full Transportation" scenarios which assume that every fish collected is transported (except the CSS fish). This calculation provided the number of fish

collected at each dam if no PIT-tagged fish were returned to the river. In other words, this calculation is based solely on the number of fish that are not collected and transported at upstream dam(s).

In the second calculation we assumed that the only fish transported at each Snake River collector dam are the CSS fish. This calculation provided the number of fish collected at each dam if the remaining PIT-tagged fish were returned to the river. This calculation includes both the fish that were returned to the river at upstream dam(s) and the fish that were not collected at upstream dam(s). Because the number derived from the second calculation includes the number from the first calculation, the difference between the numbers from these two calculations is the number of PIT-tagged fish that were collected at each dam that were not accounted for because they were returned to the river at each dam (the number for each dam was added to the appropriate "... fish collected ..." columns in Tables 7-8). This difference in the number of fish collected was then expanded to the number of fish that arrived at the dam by dividing by the FGE of that dam, and was added to the number of fish that arrived at McNary Dam because they had not been collected and transported at upstream dams under both the "Transportation with Spill" and "Full Transportation" scenarios (column "Listed fish to McNary" in Tables 2 and 3, respectively).

Calculation 1 (Transportation)

Transportation with Spill Scenario--The numbers presented below assume that 55.7% of the PIT-tagged fish arriving at Lower Granite Dam will not be collected (FGE = 44.3%), and that 30% of the CSS fish are returned to the river. In addition, 20,000 wild and 229,598 hatchery fish will be released into the tailrace of Lower Granite Dam from marking at the dam, and 71,475 will be released into the tailrace of Ice Harbor Dam.

Using the FGEs in Table 2, the estimated number of PIT-tagged fish collected at each dam below Lower Granite Dam in 2006 will be

Dam	Wild	Listed hatchery	Unlisted hatchery	Total
Little Goose	17,843	46,875	109,569	174,287
Lower Monumental	6,185	17,311	37,098	60,594
McNary	3,465	15,965	39,537	58,967

Full Transportation Scenario--The numbers presented below assume that 40.0% of the PIT-tagged fish arriving at Lower Granite Dam will not be collected (FGE = 60.0%), and that 30% of the CSS fish are returned to the river. In addition, 20,000 wild and 229,598 hatchery fish will be released into the tailrace of Lower Granite

Dam from marking at the dam, and 71,475 will be released into the tailrace of Ice Harbor Dam.

Using the FGEs in Table 3, the estimated number of PIT-tagged fish collected at each dam below Lower Granite Dam in 2006 will be

Dam	Wild	Listed hatchery	Unlisted hatchery	Total
Little Goose	20,331	54,228	132,968	207,527
Lower Monumental	5,126	15,140	32,219	52,485
McNary	3,322	22,701	59,450	85,473

Calculation 2 (Only CSS fish transported)

This calculation assumes that all collected PIT-tagged fish (except the CSS fish) are returned to the river at each Snake River collector dam.

For the PIT-tagged fish returned to the river at each collection dam, the only loss of fish as they migrate downstream is the mortality through each reservoir and dam. Based on the NMFS survival studies, survival through each reservoir and dam was estimated to be 90%. The estimated number of PIT-tagged fish collected at each dam below Lower Granite Dam in 2006 will be

Transportation with Spill Scenario

Dam	Wild	Listed hatchery	Unlisted hatchery	Total
Little Goose	25,034	53,437	121,389	199,860
Lower Monumental	16,731	31,501	72,817	121,049
McNary	14,644	31,574	79,263	125,481

Full Transportation Scenario

Dam	Wild	Listed hatchery	Unlisted hatchery	Total
Little Goose	33,276	66,042	154,248	253,566
Lower Monumental	23,237	39,427	94,973	157,637
McNary	30,115	59,479	155,239	244,833

Subtracting collection numbers estimated by Calculation 1 from Calculation 2 provides the number of unaccounted for PIT-tagged fish that were collected at each dam (Appendix Table A1).

Appendix Table A1. Estimates of the number of unaccounted for PIT-tagged spring/summer Chinook salmon that will be collected at each of the collection dams, and estimates of how many of these fish will arrive at McNary Dam, 2006.

Transportation with Spill Scenario

Dam	Wild	Listed hatchery	Unlisted hatchery	Total
Number of unaccounted for PIT-tagged fish collected:				
Little Goose	7,191	6,562	11,820	25,573
Lower Monumental	10,546	14,190	35,719	60,455
McNary	11,179	15,609	39,726	66,514
Number of unaccounted for PIT-tagged fish that arrived at McNary Dam (FGE = 0.389):				
McNary	28,738	40,126	102,123	170,987

Full Transportation Scenario (No Spill)

Dam	Wild	Listed hatchery	Unlisted hatchery	Total
Number of unaccounted for PIT-tagged fish collected:				
Little Goose	12,945	11,814	21,280	46,039
Lower Monumental	18,111	24,287	62,754	105,152
McNary	26,793	36,778	95,789	159,360
Number of unaccounted for PIT-tagged fish that arrived at McNary Dam (FGE = 0.80):				
McNary	33,491	45,973	119,736	199,200

Appendix B.

Determination of the effects of returning all PIT-tagged steelhead to the river at each collection dam on the number of fish that arrive at each subsequent dam

We surveyed researchers regarding the number of outmigrating PIT-tagged steelhead in the Snake River we could expect in 2006. We found that 27,400 (16,100 of which will be listed) hatchery fish will be PIT tagged prior to release above Lower Granite Dam. Based on the survival rates of the various hatcheries releasing fish, we estimate that 20,676 (11,720 of which will be listed) will arrive at Lower Granite Dam. Another 12,735 (6,242 of which will be listed) hatchery steelhead (PIT tagged at traps) will arrive at Lower Granite Dam, bringing the total to 33,411 hatchery fish (which includes 17,962 listed fish) arriving at Lower Granite Dam. In addition, 6,836 wild steelhead PIT tagged at traps will arrive at Lower Granite Dam.

National Marine Fisheries Service will be PIT-tagging steelhead at Lower Granite Dam during the 2006 outmigration. As part of this marking, 40,000 PIT-tagged fish will be released into the Lower Granite Dam tailrace. Of these, approximately 20,000 will be wild fish, 9,547 will be listed hatchery fish, and 10,453 will be unlisted hatchery fish. All of the fish collected at Little Goose and Lower Monumental Dams will be diverted back to the river. WDFW plans to release 1,550 PIT-tagged fish into the Tucannon River. Of these, 500 will be wild and 1,050 will be listed hatchery fish.

We performed two calculations to determine the expected number of PIT-tagged fish collected at each collector dam. The first calculation made use of the same formulas used under the "Transportation with Spill" and "Full Transportation" scenarios which assume that every fish collected is transported. This calculation provided the number of fish collected at each dam if no PIT-tagged fish were returned to the river. In other words, this calculation is based solely on the number of fish that are not collected and transported at upstream dam(s).

In the second calculation we assumed that no fish are transported. This calculation provided the number of fish collected at each dam if all PIT-tagged fish were returned to the river. This calculation includes both the fish that were returned to the river at upstream dam(s) and the fish that were not collected at upstream dam(s). Because the number derived from the second calculation includes the number from the first calculation, the difference between the numbers from these two calculations is the number of PIT-tagged fish that were collected at each dam that were not accounted for because they were returned to the river at each dam (the number for each dam was added to the appropriate "... fish collected ..." columns in Tables 9-10). This difference in the number of fish collected was then expanded to the number of fish that arrived at the dam by dividing by the FGE of that dam, and was added to the number of fish that arrived at McNary Dam because they had not been collected and transported at upstream dams under both the "Transportation with Spill" and "Full Transportation" scenarios (column "Listed fish to McNary" in Tables 5 and 6, respectively).

Calculation 1 (Transportation)

Transportation with Spill Scenario--Assuming that 50.0% of the PIT-tagged fish arriving at Lower Granite Dam will not be collected (FGE = 50.0%), 3,418 (6,836 x 0.500) wild, 8,981 (17,962 x 0.500) listed hatchery, and 7,724 (15,449 x 0.500) unlisted hatchery fish will reach the Lower Granite Dam tailrace. In addition, 20,000 wild, 9,547 listed hatchery, and 10,453 unlisted hatchery fish will be released into the tailrace from marking at the dam. Therefore, the total numbers of PIT-tagged fish in the Lower Granite Dam tailrace will be 23,418 (3,418 + 20,000) wild, 18,528 (8,981 + 9,547) listed hatchery, and 18,177 (7,724 + 10,453) unlisted hatchery fish.

Using the FGEs in Table 5, the estimated number of PIT-tagged fish collected at each dam below Lower Granite Dam in 2006 will be

Dam	Wild	Listed hatchery	Un-listed hatchery	Total
Little Goose	12,055	9,538	9,358	30,951
Lower Monumental	4,180	3,624	3,056	10,860
McNary	741	786	541	2,068

Full Transportation Scenario--Assuming that 20.0% of the PIT-tagged fish arriving at Lower Granite Dam will not be collected (FGE = 80.0%), 1,367 (6,836 x 0.20) wild, 3,592 (17,962 x 0.20) listed hatchery, and 3,090 (15,449 x 0.20) unlisted hatchery fish will reach the Lower Granite Dam tailrace. In addition, 20,000 wild, 9,547 listed hatchery, and 10,453 unlisted hatchery fish will be released into the tailrace from marking at the dam. Therefore, the total numbers of PIT-tagged fish in the Lower Granite Dam tailrace will be 21,367 (1,367 + 20,000) wild, 13,139 (3,592 + 9,547) listed hatchery, and 13,543 (3,090 + 10,453) unlisted hatchery fish.

Using the FGEs in Table 6, the estimated number of PIT-tagged fish collected at each dam below Lower Granite Dam in 2006 will be

Dam	Wild	Listed hatchery	Un-listed hatchery	Total
Little Goose	17,308	10,643	10,970	38,921
Lower Monumental	1,450	1,374	713	3,537
McNary	569	1,169	280	2,018

Calculation 2 (No Transportation)

Assuming that 100% of the collected PIT-tagged fish are returned to the river at Lower Granite Dam, 26,836 (6,836 + 20,000) wild, 27,509 (17,962 + 9,547) listed hatchery, and 25,902 (15,449 + 10,453) unlisted hatchery fish will reach the tailrace.

Because 100% of the PIT-tagged fish were assumed to be returned to the river at each collection dam, the only loss of fish as they migrate downstream is the mortality through each reservoir and dam. Based on the NMFS survival studies, survival through each reservoir and dam was estimated to be 90%. The estimated number of PIT-tagged fish collected at each dam below Lower Granite Dam in 2006 will be

Transportation with Spill Scenario

Dam	Wild	Listed hatchery	Un-listed hatchery	Total
Little Goose	13,815	14,162	13,334	41,311
Lower Monumental	10,785	11,316	10,175	32,276
McNary	3,710	4,037	3,501	11,248

Full Transportation Scenario

Dam	Wild	Listed hatchery	Un-listed hatchery	Total
Little Goose	21,736	22,283	20,980	64,999
Lower Monumental	14,453	15,166	13,637	43,256
McNary	16,210	17,639	15,295	49,144

Subtracting collection numbers estimated by Calculation 1 from Calculation 2 provides the number of unaccounted for PIT-tagged fish that were collected at each dam (Appendix Table B1).

Appendix Table B1. Estimates of the number of unaccounted for PIT-tagged steelhead that will be collected at each of the collection dams, and estimates of how many of these fish will arrive at McNary Dam, 2006.

Transportation with Spill Scenario

Dam	Wild	Listed hatchery	Unlisted hatchery	Total
Number of unaccounted for PIT-tagged fish collected:				
Little Goose	1,760	4,624	3,976	10,360
Lower Monumental	6,605	7,692	7,119	21,416
McNary	2,969	3,251	2,960	9,180
Number of unaccounted for PIT-tagged fish that arrived at McNary Dam (FGE = 0.206):				
McNary	14,413	15,782	14,369	44,564

Full Transportation Scenario (No Spill)

Dam	Wild	Listed hatchery	Unlisted hatchery	Total
Number of unaccounted for PIT-tagged fish collected:				
Little Goose	4,428	11,640	11,313	27,381
Lower Monumental	13,003	13,792	14,453	41,248
McNary	15,641	16,470	17,359	49,470
Number of unaccounted for PIT-tagged fish that arrived at McNary Dam (FGE = 0.90):				
McNary	17,379	18,300	19,288	54,967